COMPUTERWORLD

THE NEWSWEEKLY FOR THE COMPUTER COMMUNITY

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The Omega 480 From Control Data Corp.

CDC Announces Omega Line As IBM 370 Replacement

By Frank Vaughan
Of the CW Staff

MINNEAPOLIS — The "Colt 45" which got derailed last year after IBM introduced its 370/138 and 148 is back on the track now and was formally announced last week as part of Control Data Corp.'s IBM-compatible Omega line.

The Omega 480-I and 480-II, which are being offered in six models, are intended as direct replacements for IBM 370/135 to 148 CPUs, CDC said.

The systems provide users with performance improvements of 10% to 100% at prices ranging from 5% to 30% less than the corresponding IBM equipment, CDC claimed.

Operational tests of Omega systems conducted by CDC have indicated IBM software available for 370 systems (with the exception of time-dependent coded programs) will run without modification on an equivalent Omega configuration, according to a CDC spokesman. The testing included software operating systems, program products and user programs.

Operating systems that support Omega processing include DOS, DOS/VS, OS/-MFT and MVT, OS/VS1, OS/VS2 (both SVS and MVS versions) and VM/370, he said.

A basic system includes the CPU, microprogrammed control storage, data channels and 512K to 2M bytes of central memory. It can be configured with plug-compatible peripherals that include disk, tape and printer subsystems, as well as the CDC 38500 mass storage system.

Central processor operations are functionally compatible with the IBM 370/135, 138, 145 and 148 CPUs, CDC said. The system uses emitter-coupled logic packaged on individual circuit cards. A total of 13 cards is needed for the entire logic circuitry of the

(Continued on Page 6)

Rash of Changes, Additions Spreads to IBM Terminals, Communications Equipment

By John P. Hebert
Of the CW Staff

WHITE PLAINS, N.Y. — The recent rash of additions and pricing changes in IBM's mainframe and peripherals lineup has spread to the firm's terminal and communications equipment, erupting in additions, enhancements and price cuts there, too.

The equipment affected by IBM's actions last week include the 3270 CRT family, 3770 terminal series and 3790 communications system. In addition, the firm cut lease and purchase prices by 16% to 28% on some units in these lines and at the same time increased maintenance charges 15% on some.

It also discontinued some 3770 and 3790 products (see Page 4) and increased the remote communications capability of 3270 devices under Binary Synchronous Communications (BSC) to 9,600 bit/sec.

Within the 3270 series, IBM's introductions of the 3276 control unit/CRT station and the 3278 CRT increased the options of users looking for terminals with larger screen capacities.

Neither of these terminals are intelligent devices — they have no memory and are not programmable — but they do employ a fast-field effect transistor (FET) technology and other proprietary technologies, an IBM spokesman stated.

In addition, the density and speed of the terminals' internal circuitry has been increased compared with that of the current 3270 devices, he said.

Each of the four versions of the 3276 controller/CRT can handle up to seven 3278 terminals. Both the 3276 and 3278 are available in screen capacities of 960-, 1,920-, 2,560- and 3,440 characters (models 1 through 4, respectively).

Both of these terminals employ 7 by 14 dot matrix characters except in the case of the 3,440-character unit, where the standard 7 by 9 dot matrix composition is used for character display, IBM noted.

The 3,440-character format is made possible by packing lines closer together on a screen the same size as that offered on the larger of the current 3270 models, according to the IBM spokesman, who said the greater density does not have a negative impact on readability.

The high-density screens were suggested for program development or display of large files in the manufacturing, health, insurance and other industries.

In addition to the 3276 controller/CRT, the 3274 control unit also made its debut. The 3274 controller can handle up to 32 terminals including the 3278 CRT and 3287 and 3289 printers (see Page 4). Up to 16 of the previously available 3270 family devices can be intermixed, IBM said.

The 3274 control unit links to a 370 locally or remotely under BSC or Synchronous Data Link Control (SDLC) and to a 360 CPU using BSC, the spokesman added.

The 3274 controller and 3276 CRT/-controller can also be connected to an IBM 3 under BSC; the 3276 can be remotely linked to a 3790 communications system controller, he noted.

None of these linkage capabilities are enhancements to the 3270 product series abilities, according to the spokesman.

All of the CRT terminals introduced for the 3270 line attach remotely to a 370 CPU

(Continued on Page 4)

Wiley at ICA

Deregulation of Terminals Urged

By Ronald A. Frank
Of the CW Staff

TORONTO — Terminal equipment should be offered in a deregulated environment with federally prescribed interconnection terms, according to Richard E. Wiley, chairman of the Federal Communications Commission (FCC).

Speaking at the annual conference of the International Communications Association (ICA), Wiley said deregulation of terminal equipment would avoid the complex issue of determining whether equipment is primarily a communications or DP device.

If terminal equipment were offered in a competitive environment, the telephone industry would be able to unbundle line charges from instrument charges, respond rapidly to innovation and be less encumbered by depreciation schedule problems, he said.

Richard E. Wiley

In order to prevent potential cross-subsidies, competing carriers would have to operate through separate subsidiaries and the 1956 consent decree barring AT&T involvement in unregulated activities would have to be lifted.

"I believe the long-term benefits of ter-

(Continued on Page 4)

A User Reacts: DOS/VS Update 'Bad News'

By Bennett I. Moyle
Special to Computerworld

DOS/VS Release 34 is bad news. Large DOS/VS users have been waiting for a long time for many of the functions it provides, but I don't think Release 34 is quite what the customer ordered.

What is wrong with Release 34, in my opinion, is not what has been provided, but how it has been provided..

Seven partitions are supported, except for 3340 and 3344 users, where only six are supported. The limiting factor is supposedly the architecture of the label storage area, but coding which supports labels for up to 12 partitions was published two years ago in the Guide DOS/VS cookbook and is therefore available to anyone. Moreover, it involves only a few additional instructions.

The implication is that 3340/3344 users interested in seven partitions should replace their disks with 3350s and go through the usual one- to four person/month conversion effort so the vendor won't have to make a minor coding change. But 3344s are practically brand new, and lease and purchase arrangements also inhibit frequent switching of equipment.

The 3350 and 3330 Model II disk support implementation also has a catch — and a foreboding one. The user is compelled to use Vsam for index sequential file support.

Vsam is definitely bigger than a breadbox and, although it can be beneficial to users with long-running Isam jobs and with sufficient CPU and memory resources, Vsam is counterproductive for many DOS/VS installations.

Regardless of performance, the conversion to Vsam of typically 100 to 300 Isam files is another expensive chore. An enterprising software house could probably develop native 3350 Isam support in a few days' time, and hopefully somebody will, but the implication is that all future disk or similar storage

(Continued on Page 6)

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Andreini Charges at Trial

IBM Product Leaks Halt Market Activity

By Catherine Arnst
Of the CW Staff

NEW YORK — IBM can bring "an absolute halt" to activity in the computer marketplace by releasing information on products before they are announced, according to Richard Andreini, vice-president of marketing for Intersil, Inc. (formerly Advanced Memory Systems [AMS]).

Preannouncement, as the practice is called, occurs frequently, although it is officially against IBM policy, Andreini testified recently at the U.S. vs. IBM antitrust trial here.

The witness, who was an IBM salesman before joining AMS, said there is a policy statement in the IBM branch office manual that states no one is allowed to make preannouncements.

However, IBM salespeople and other sources are giving out product plans "well in advance" and that has happened "very blatantly in the last three to four years," Andreini said.

As an example, he cited a recent *Computerworld* article that indicated the newly announced 3033 processor might be the first in a series of new processors IBM has in the wings [CW, April 18].

Forces Decision Delay

Preannouncements "are often used by IBM salespeople to force a customer to delay his decision. The statement might be . . . 'well, you don't want to consider this product because IBM will be making an announcement that will double the density of such and such,' " Andreini testified.

An "extremely important psychological advantage" is created for IBM through its use of frequent announcements and preannouncements, he said.

"Oftentimes the announcement to some of those customers may not be significant. But because IBM is so important to them in terms of their DP and their accomplishing the objectives within their company, they will evaluate the announcement anyway, even though it may not be very significant to them," he explained.

"That period . . . can keep the marketplace with all of its attention focused on IBM and its announcements and place all the plug-compatible manufacturers and often general-purpose computer manufacturers on the defensive to respond to the IBM announcements," he said.

Andreini admitted that no IBM salesperson had ever given him a preannouncement directly, but he claimed to have learned of over 100 such situations since 1972 from all sections of the country. He described several preannouncements from IBM regarding the 370/138 and 148, announced in May 1976 to replace the 370/135 and 145.

AT&T's Long Lines Division was considering AMS memory on its IBM 135 and 145 product in March 1974, but Jim Hanley, AT&T's manager of hardware evaluation, said the IBM salesman told him there was a replacement for these systems coming along, Andreini said.

"The IBM salesman told Hanley he should not consider add-on memory at that time and that replacement would be called a 138 and 148," he added.

IBM preannouncements place the plug-compatible manufacturers "in a defensive position," Andreini continued.

"It often makes it necessary for us, in some cases when we know the announcement is imminent . . . [to] begin some preparation in anticipation [of] when the announcement may be made," he said.

Preannouncements "create a great deal of uncertainty and are often much more difficult to deal with . . . than are actual announcements which are firm and hard and there are no guesses as to what they mean," Andreini said.

Bell Hints Justice Ready to Hire Private Lawyers for IBM Case

By Edith Holmes
Of the CW Staff

WASHINGTON, D.C. — Attorney General Griffin B. Bell has hinted to the Senate Subcommittee on Antitrust and Monopoly that the Justice Department may employ outside attorneys in the trial of its massive case against IBM.

"Discussions are under way now" to hire outside counsel experienced in complex litigation who could advise the Antitrust Division staff currently engaged in the trial of the antitrust suit against IBM in New York City, Bell told the subcommittee at oversight hearings here recently.

While Justice Department officials would not confirm this, a source close to the Antitrust Division said an employment offer has already been extended to an attorney working on California Computer Products, Inc.'s private antitrust suit against IBM.

Asked by subcommittee chairman Edward Kennedy (D-Mass.) whether there was anything Bell could personally do to move U.S. vs. IBM along, the Attorney General stated he is not involved in the case because the Atlanta law firm of which he was a partner has represented IBM in the past.

In his Cabinet-level position, Bell said he means "to make antitrust a high-priority item."

Bell affirmed his confidence that the Antitrust Division's staff "contains some of the ablest antitrust trial lawyers in the country." He will "personally fight to see to it that they are provided with the very best in the way of litigation resources," he added.

Not unaware of the criticism that has attended the Justice Department's efforts to bring big monopoly cases like U.S. vs. IBM to trial, however, Bell noted that "we . . . can do more to confine the 'big case' within manageable boundaries.

"To begin with, focused pleadings and narrow theories promote shorter trials," he said. "Where possible, the government will set out its theory of a case clearly at an early point in the litigation process.

A "blue ribbon" panel of judges chosen to hear antitrust cases "is an appealing idea we must resist," however, because it would set a dangerous precedent for patent, trade secret and all other technically oriented cases with which the law must deal, Bell said.

The Attorney General expressed a need for the federal government to identify those situations in which structural changes to an industry might best be met through legislation rather than litigation.

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NOSTALGIA

After testing IBM's new sort in VS, we know who the kid reminds us of!

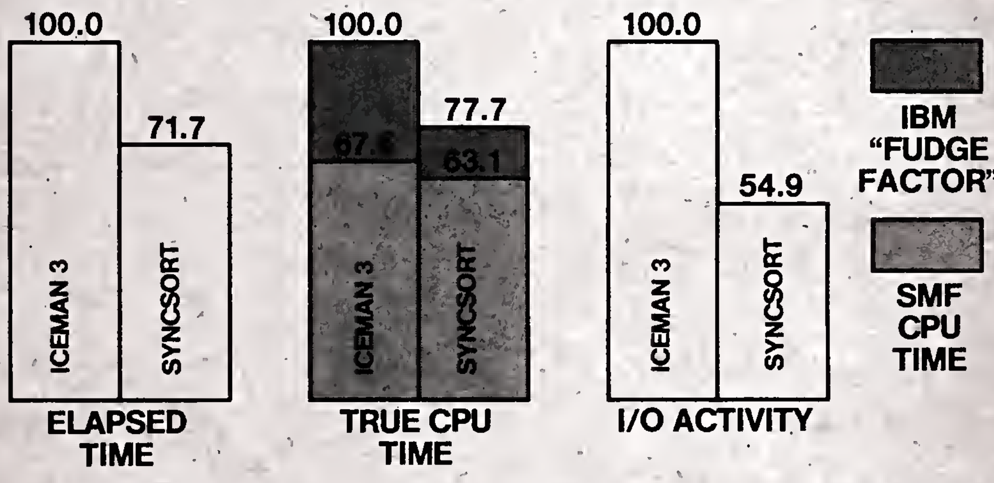
(SyncSort—a few years ago.)

Call (201) 568-9700

Find out what lies *ahead* in sorting.

We've just finished testing IBM's new SM1-5740, Release 3, against SyncSort III-and-a-half in VS. And it turned out to be quite an experience! A little like looking in the mirror and seeing ourselves as we were a few years ago.

Not that the results of the tests themselves were surprising. *ICEMAN 3 didn't do much better in VS1 and SVS than it did in the earlier MVS tests.* The charts below bear that out:



In fact, ICEMAN 3 wouldn't have done as well as it did if IBM hadn't supplied its own "scorekeeper" in the form of SMF. As you probably know, SMF tends to be a little myopic, particularly where IBM sorts are concerned.

In VS, for example, SMF records only a portion of the True CPU Time that a sort consumes. The unrecorded remainder is lumped together in an amorphous package we refer to as the "IBM Fudge Factor." As a result, SMF has a lamentable tendency to score sorting errors as hits — and *vice versa.*

But what really floored us during the VS tests was a very strong sense of *deja vu* — of having been there before. We finally figured out what caused it: *ICEMAN 3 bears a striking resemblence to our old SyncSort II.*

Some of you who've been around awhile will remember that we brought out SyncSort II a few years ago as the answer to IBM's SM1-5734. And for a stretch there SyncSort II was king of the hill — the most advanced sort of its day.

The Computer Giant countered by introducing SM1-5740. It was accompanied by much hoopla and glowing references to "sophisticated I/O techniques, PCI's, PEER for pre-sequenced data" and so forth.

The trouble was — for SM1-5740 anyway — that we brought out several new versions of SyncSort during that period.

And before long those "sophisticated I/O techniques, PCI's, etc." began to fall from grace.

Now, wonder of wonders, IBM brings out ICEMAN 3, which skips back over all those generations to SyncSort II. In the meantime, here we are, coming out with new techniques that are going to make ICEMAN 3 even more outmoded than it is today.

If IBM keeps on in this vein, they're going to re-invent the roundest wheel of them all! But anyway we'd like to thank them for one thing:

Taking us back to the days of our youth!

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IBM Changes 3790 Repertoire, Sets '78 for Programming Aids

By John P. Hebert
Of the CW Staff

WHITE PLAINS, N.Y. — IBM made changes in its 3790 communications systems repertoire last week and announced it will add software enhancements to the 3790 in 1978.

The spotlight on 3790 changes was focused primarily on the addition of a remote link adapter that will allow users of the communications system to transmit data between a central-site controller and terminals in geographically dispersed locations.

The 3791 controller adapter permits 1,920-character versions of the 3274 and 3276 CRT stations to be connected to communications lines. Previously, a spokesman noted, terminals could be attached only locally.

Up to five remote data link adapters can be attached to a single 3791 and each adapter can support up to five 3276s with as many as seven additional 3270 devices attached to each, according to IBM.

In addition, IBM introduced the 3791 Model 1C controller and announced it has withdrawn the previously available models 1A and 1B effective immediately, the spokesman noted.

The Model 1C features 10M-character storage which, unlike the 1A and 1B, can be upgraded at the user location to the larger models 2A or 2B with 20M- and 30M-character storage capacities, the firm noted.

And control storage in the 3791 has been increased from a maximum of 64K bytes to 192K bytes, which IBM said will allow for greater configuration flexibility.

Program Product

IBM also introduced a program product, Display Management System/3790 (DMS/3790), which it said makes it easier for 3790 users to design, write, test and maintain applications programs.

DMS/3790 produces programs using a programmer-prepared forms set to define screen layouts, I/O fields, field-editing characteristics and other specifications, IBM claimed.

An optional DMS/3790 communications interface monitor can handle transmissions between the 3791 controller and the host CPU. Standard DMS/3790 subsystems reportedly establish standard interfaces and protocols between modules, allow data inquiry by key-field specification and provide temporary working storage for applications programs.

The program also handles the distribution of data between the host and the 3790; it is scheduled to appear during the first quarter of 1978 for a monthly license fee of $300.

First shipments of the 3791 Model 1C controller are slated for the third quarter. The basic unit can be rented for $640/mo, leased for $545/mo and purchased for $22,100.

The data link adapter will be available in 1978's first quarter; it can be rented for $35/mo, leased for $30/mo and purchased for $1,200.

Terminals Withdrawn

The IBM 3770 communications system of keyboard/printer terminals has been consolidated into five basic units: the 3771 models 1, 2 and 3; the 3774 programmable models P1 and P2; the 3775 Model P1; and the remote job entry (RJE) 3776 models 1 and 2 and 3777 models 1 and 2.

IBM has withdrawn the 3773 line and the 3774 models 1 and 2 as well as the 3775 Model 1, effective in mid-August, according to the spokesman.

IBM additionally brought out enhancements for the programmable 3774 and 3775 to support programmable communications and RJE under its unified communications framework, Systems Network Architecture (SNA).

Programmable communications is said to enable user-written terminal programs to concurrently interact with host computer applications programs and local input and output units.

The RJE support, IBM added, allows jobs to be submitted to the host from the terminal under Power, RES and JES2 and JES3. Job output from the computer can be routed to the terminal's printer or card punch or returned to diskette storage.

Both enhancements will be offered free to users during the third quarter of 1978, IBM said, adding another no-charge feature which excludes programmable functions will enable the 3774 and 3775 to emulate nonprogrammable operations and allow users to expand existing installations of 3770 series terminals.

Printers Added to 3270 Line

WHITE PLAINS, N.Y. — In addition to IBM 3270 series CRT stations and CRT/controller combinations, printers were added to the 3270 line and maintenance charges were increased on products in both the 3270 and 3770 series.

IBM brought out the 3287 matrix printer, which features bidirectional serial printing at speeds of 80- and 120 char./sec, and the 3289 line printer, which is capable of operation at speeds ranging from 80- to 400 line/min, depending on the model and character set used, the firm said.

The 3287 matrix printer and 3289 line printer are scheduled for delivery in the fourth quarter of this year and third quarter of 1978 respectively.

The 80 char./sec and 120 char./sec 3287 printers will cost $5,680 and $6,055 respectively and the models 1 and 2 of the 3289 line printer (120- and 300 line/-min) will be priced at $11,110 and $16,560, according to a spokesman.

Those products for which IBM chose to boost upkeep charges by about 15% are all 3271 and 3272 controllers, all models of the 3275 single remote display with integrated controllers and all 3284 and 3286 printers, the spokesman said.

Products in the 3770 line affected by the maintenance increase of about 15% are all models of the 3771 and 3773 and the 3774 models 1 and 2, he said.

IBM Extends Terminal Options

(Continued from Page 1)

under SDLC and remotely to 360 mainframes under BSC discipline, IBM said.

The machines are provided with user access panels for attaching cables, keyboards and power cords. Built-in special test features and other diagnostic functions allow users to check the operation of each device, according to IBM.

A remote installation consisting of one 3276 Model 2 control unit/1,920-character CRT, three 3278 Model 2 display stations and a 3287 Model 1 printer rents for $642/mo, leases for $546/mo and sells for $23,695, IBM said, adding the prices reflect last week's 16% reduction of rental and purchase prices of 3270 devices.

The 3274 controller models 1A and 1B (local Systems Network Architecture and local attached 3270-compatible, respectively) will be available in the second quarter of 1978, while the 3274 remotely attached Model 1C (SDLC/BSC) will be available in the first quarter.

The 3276 models operating under BSC and SDLC will not be available until the third or fourth quarters of 1978, except the 1,920-character screen Model 2, which will be available in the first quarter, IBM said.

The 3278's appearance is slated for the first quarter of 1978, except the 1,920-character Model 2 with DLC and BSC capabilities, which is scheduled for the fourth quarter of 1977.

Terminal Deregulation Urged

(Continued from Page 1)

minal equipment deregulation substantially will outweigh any potential short-term [problems]," Wiley said.

In order to facilitate the sharing and resale of carrier facilities, Wiley proposed the creation of a "contract carrier" that would offer service under contract instead of under tariff.

"Such a novel approach would enhance opportunities for new entrepreneurs by reducing entry costs and burdens associated with governmental processes," he said.

The FCC chairman also proposed an independent AT&T subsidiary "to handle all private-line services offered directly to users." This subsidiary would lease interstate private lines under the same terms and conditions as all other competing carriers.

This change would enhance the likelihood of full and fair competition, he said.

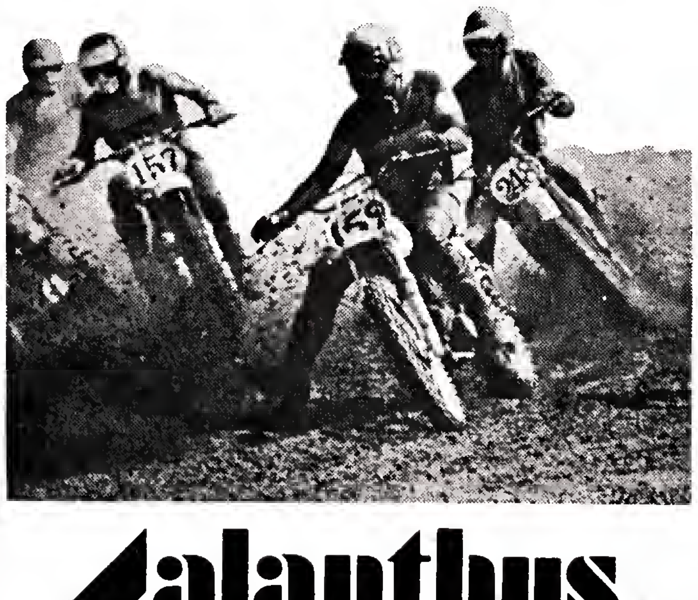
Turning to the international area, Wiley called for the creation of a single carrier's carrier for satellite and cable planning and ownership. This entity would be restricted to supplying facilities only to end-to-end carriers and it could not offer services directly to users.

Such a unified carrier would permit integrated U.S. planning, provide a single interface with foreign telecommunications administrations and "reduce disincentives to selection of the least cost facilities consistent with reliability and quality service objectives."

In addition, the FCC should be authorized by Congress to participate in international facilities negotiations, he suggested.

The carrier's carrier would replace the international competition between existing international carriers, which "simply is not realistic," Wiley said.

Finally Wiley suggested that the separation between domestic and international services may no longer be appropriate. By restricting carriers to operating in either the domestic or international area, efforts to maximize the consumer's options and alternatives may be inhibited, he said.


ON ANY TRACK WE'RE HARD TO BEAT

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Washington Update

Capitol Hill Not Very Excited About Electronic Mail

By Edith Holmes
Of the CW Staff

WASHINGTON, D.C. — The Commission on Postal Service's recommendation that the Postal Service might have to eliminate Saturday mail delivery in order to cut costs has stirred more congressional interest here than its suggestion that the post office get into electronic message transmission — and fast.

Since the commission made its report on the state of the Postal Service to Congress and the President in mid-April [CW, April 25], several congressmen have voiced their "disappointment" that the American public is again being told it must accept "poorer service, higher rates and greater appropriations" in order to keep the post office alive.

Additional, unanimous commission recommendations that the post office immediately enter joint ventures with private firms to provide electronic mail where needed and that the service decide in two years whether to create an electronic message system of its own have largely been ignored, according to Capitol Hill observers.

But there are some members of the House and the Senate who are sufficiently comfortable with the concept of electronic mail to appreciate the impact of the commission's recommendations.

Rep. James M. Hanley (D-N.Y.) praised the commission's report for supporting greater postal involvement in electronic communications and for criticizing the less than .2% of funds the Postal Service makes available to its R&D program.

As chairman of the House Subcommittee on Postal Operations and Services, Hanley may be able to help his colleagues understand the significance of these recommendations, commission chairman Gaylord Freeman suggested.

Even more attuned to the possible decay of the post office's elaborate distribution system should it continue to lack electronic communications is Sen. John Glenn (D-Ohio), who chairs the Senate Subcommittee on Energy, Nuclear Proliferation and Federal Services.

The former astronaut said he understood the commission's report to say "electronics is the crux of the future for the post office."

While he was not prepared to endorse the commission's recommendations in the area of electronic communications, Glenn indicated he wanted to hear from everyone "on the issue of electronic mail."

Executive Branch Not Waiting . . .

The executive branch of the federal government isn't likely to wait for the Postal Service or Congress to decide the question, however.

Electronic fund transfers (EFT) are already being used by the Treasury Department to deposit federal pension checks directly into the bank accounts of their recipients [CW, April 25].

Now the Department of Transportation's Federal Highway Administration (FHWA) has announced its use of EFT to improve delivery of highway aid money to state governments.

Under the highway aid program, the states receive reimbursements for costs they incur during right-of-way design and construction efforts, an FHWA spokesman said.

"Continuing escalation of highway construction costs, failure of tax revenues to rise in comparison with construction costs, economic impacts of energy and materials shortages and emphasis on speeding up vital construction programs have all served to create cash flow problems for many state governments," he explained.

EFT provides an effective means of easing this cash flow problem by speeding delivery of federal funds to states five to seven days over mail delivery.

A computer-to-computer link joins the Treasury Department's Washington, D.C., disbursing office, which orders payments from the Federal Aid Highway Trust Fund, to the Federal Reserve Banks in various cities which issue the actual payments to banks that are members of the Federal Reserve system.

The FHWA is also urging states to use a telecopier or facsimile transmission of data for payment of claims in lieu of or to supplement regular mail service. This use of electronic mail helps the administration complete reimbursements to the states from two to five days more quickly.

. . . And Neither Is the Air Force

Congressional and Postal Service confusion on the issue of electronic mail isn't hampering Air Force efforts to improve communications, either.

The Air Force Systems Command (AFSC) recently completed the first stage of its Acquisition Management Information System (Amis), an electronic mail system designed to keep tabs on the myriad of details surrounding the command's research, development and production contracts.

More than 140 terminals at AFSC purchasing offices throughout the nation feed source data on potential contracts into the system via magnetic cards, an Air Force spokesman explained. This information is edited against existing AFSC contracts at the Air Force Contract Management Division (AFCMD) at Kirtland Air Force Base in New Mexico and returned to the purchasing office in final contract form.

The automation of source data on these contracts represents the first of three stages in the Amis project. The Air Force will work this spring to transfer the contract data base from AFCMD to an IBM 370/155 at Wright-Patterson Air Force Base in Ohio, where the Amis program office is located.

The system permits the Air Force to answer a question on a complex contract in two minutes rather than the five days such queries once required, according to Col. Tadeus L. Jakubowski, director of data systems procurement for the AFSC.

Since Amis began, the administrative error rate in AFSC contracts has dropped from the 25% to 30% range to less than 5%, the colonel said.

"Manpower savings have been estimated at more than $300,000 per year," he said.

Jakubowski believes Amis could lead to a total acquisition management information system to monitor Air Force procurement of weapon systems.

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User Calls DOS/VS Update 'Bad News'

(Continued from Page 1)

media from IBM will not include native Isam support.

Problem for 145 Users

The partition balancer feature presents a problem for 370/145 users. The balancer uses the clock comparator feature, which is a standard or no charge item on other 370 models, but costs $5,500 to purchase or $115/mo to rent on a 145.

I understand the clock comparator is required, even if the balancer isn't used, when the Advanced Functions-DOS/VS release is used at all, simply because the Advanced Functions coding checks for it.

Since DOS/VS hasn't used the clock comparator before for anything, few 145s running DOS/VS will have acquired the feature. It should be noted that the half-dozen or so independently developed partition balancers have managed to get by nicely without requiring the clock comparator.

Regarding Advanced Functions-DOS/VS as a program product, I feel users are probably better off paying for software enhancements since it provides more incentive for the vendor to respond to user requests.

Advantage for Vendors

In theory at least, it should also make it easier for independent software developers to offer enhancements, since they do not have to compete with a vendor which provides the same or a similar function at no charge in a subsequent release; the customer becomes accustomed to purchasing control system functions.

However, in the specific case of Advanced Functions, unrelated functions are packaged together and priced sufficiently low that it will be difficult for independent software developers to be competitive.

Worse, it seems that even when the software is priced, it is still developed in a manner encouraging hardware expansion and change.

Upkeep Dilemma

In addition, there appears to be a potential maintenance problem with Advanced Functions. IBM is good at maintaining its software — it certainly gets enough practice — but the Advanced Functions product will apparently require modification or replacement of many of the key components of DOS/VS, which may mean two sets of fixes for most errors encountered in Release 34 will be needed. That could produce problems for both vendor and customer.

Moyle is senior systems programmer at the Federal Reserve Bank of Minneapolis. He is also manager for Guide's DOS/VS Performance Project and former president of the Minnesota DOS Users Group. His views do not necessarily reflect the opinions of his employer or those of the users groups.

Omega Line Designed As 370 Replacement

(Continued from Page 1)

processor.

Control storage is microprogrammed bipolar random-access memory with a 50 nsec cycle time. System control is loaded from a flexible diskette in the operator's console desk; it is expandable, the spokesman said.

Central memory is based upon 4K MOS chips and is expandable from the minimum 512K bytes to the 2M-byte maximum in 512K-byte increments. The memory operates at 400 nsec for read/write accesses, according to the spokesman.

Memory also includes error checking and correction for single-bit errors and the detection of double-bit errors, he added. Standard reconfiguration, which permits users to relocate memory addresses in different basic storage modules, enables users to isolate memory failures while continuing system operations using other portions of memory, he claimed.

System memory and storage control also include system and microdiagnostic procedures to permit the isolation of failures down to the individual memory chip level, he noted.

Data I/O channels support all peripheral devices that are compatible with published IBM I/O standards, excluding those that require direct access control, he said.

One byte-multiplexer channel and two block-multiplexer channels are standard; two block-multiplexer channels can be optionally added, he indicated.

A maximum transfer rate of 50,000 byte/-sec in byte mode and 180,000 byte/sec in burst mode is possible between peripherals and main memory, he claimed.

Individual block multiplexers transfer data at a maximum rate of 1.85M byte/sec while the aggregate data rate for all block channels is up to 5M byte/sec. Rates are achieved through the use of double-word buffers, CDC said.

Purchase prices for Omega systems begin at $355,000 for the Model 480-I with 512K bytes of memory. Monthly maintenance for this system by CDC's Comma organization costs $1,320.

The largest Omega 480-I with 2M bytes of memory sells for $505,000 with a $1,925/mo maintenance charge.

Field-installable 512K-byte memory increments that are housed in the basic mainframe cost $50,000 each, with a $380/mo maintenance charge.

A 1M-byte 480-II costs $490,000 and the 2M-byte version is priced at $590,000. Monthly maintenance charges are $1,915 and $2,165 respectively.

The systems are also available on an installment purchase plan as well as through a series of three- to seven-year leases.

Deliveries of Omega 480-I systems will begin in June; 480-II shipments are scheduled to begin in the early part of 1978. At that time, a field upgrade from an installed Model I to a higher performance Model II will be available as an installation kit for $85,000, CDC said.

The kit will include a processor speed-up, operator display console and two additional data channels.

CDC is marketing the system under an agreement with IPL Systems, Inc. of Bedford, Mass., headed by Stephen Ippolito, who originally invented the system. IPL Systems will manufacture the mainframes.

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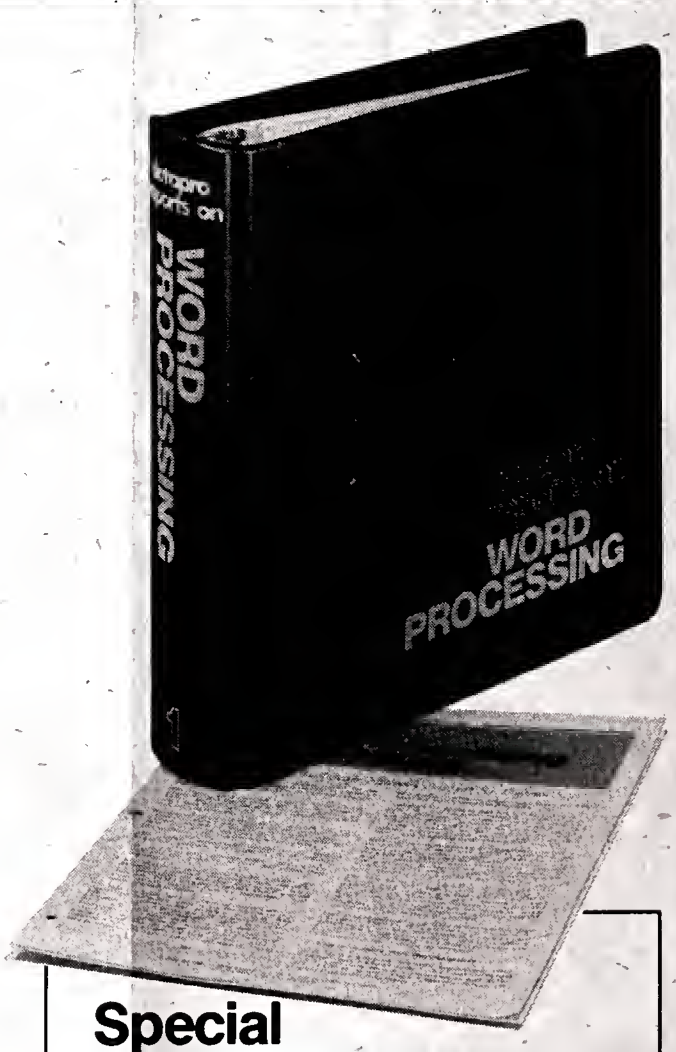

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Controller With Three Micros Among Show Debuts

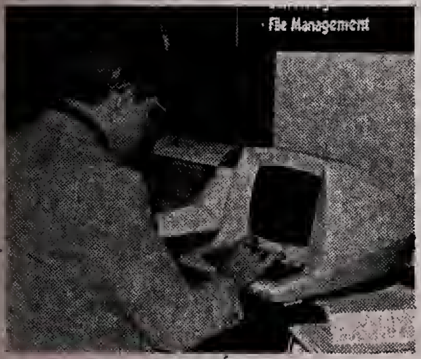
By Ronald A. Frank
Of the CW Staff

TORONTO — Vendors of communications products were represented in full force at the International Communications Association (ICA) conference here last week, and a number of them were showing products for the first time.

Western Union Data Services Co. introduced an intelligent terminal controller with multiple microprocessors and floppy disk storage.

Called Smarts, the terminal controller can be interfaced with existing terminals in the company's product line to tailor intelligent terminal configurations for a variety of applications, according to a spokesman.

The controller can support concurrent terminal operations such as batch mode communications while at the same time a printer operates locally. Transmission up to 120 char./sec to or from a CPU can be supported and the attached terminals can be polled at any time without interrupting the operator, the firm said.



CW Photo by R. Frank

ICA attendees examine Smarts terminal controller system.

Using three built-in microprocessors, the Smarts controller will allow users to consolidate multiple corporate low-speed data communications applications into a consolidated high-speed network using the same equipment, the spokesman said.

Among the applications supported by the Smarts controller, he noted, are file management, editing, electronic mail and communications control jobs.

The single floppy disk storage unit can store 270,000 characters in up to 60 operator-created files. Disk I/O is buffered and provides random-access retrieval of data through the microprocessor capability.

Most installed low-speed teleprinters and CRTs from the vendor already installed at user sites will be compatible for upgrade to intelligent configurations using the Smarts controller, the spokesman said. Initial line compatibility will be limited to code line control "202-type" modems, but additional protocols such as Ascii and Binary Synchronous support will be added, the company said.

Prices range from $242- to $400/mo for basic configurations including the Smarts controller, keyboard printer, modem and maintenance. First deliveries are scheduled for the third quarter from Western Union Data Services Co. at 70 McKee Drive, Mahwah, N.J. 07430.

Satellite Delays Eased

American Satellite Corp. of Germantown, Md., showed its Satellite Delay Compensating Unit (SDCU) designed to reduce the effect of propagation delays on satellite link data transmissions.

Described as a microcomputer-controlled data communications adapter, the SDCU operates at speeds up to 9,600 bit/sec and accepts IBM Binary Synchronous and Hasp multileaving communications without modifications, the company said.

Throughput improvements with the SDCU are said to be "two to three times higher," the company said. The SDCU restructures data blocks into an internal delay-insensitive protocol.

Buffering is built in to handle delays of up to one 1.2 sec round trip, which is equal to a double-hop satellite transmission, the firm said.

Several customers are already operating satellite links from American Satellite with the SDCU and delivery of new circuits with the unit can be scheduled in about 90 days, the company said. The SDCU adds $300/mo to the cost of a satellite channel.

Infotron Systems Corp. of Pennsauken, N.J., announced that its Miniplexer, a synchronous time-division multiplexer (TDM), has been tariffed by AT&T for interstate use on its Dataphone Digital Service (DDS).

The split-stream unit can operate on DDS lines at 2,400-, 4,800- and 9,600 bit/sec with up to four synchronous data bit streams. The tariffed offering from the phone company costs $110/mo. The Miniplexer costs $1,750.

CW
At ICA

Siemens Corp., Iselin, N.J., showed two teleprinters: the PT 80, which uses Ascii code and has a 90 char./sec printer, and the T-1000 teleprinter, which prints at 132 word/min. [CW, May 16].

Extel Corp. also showed two teleprinters, for use on TWX or Telex nets. The TWX unit costs $2,860 and is called the 308SWL. The Telex unit, designated the 305STL, costs $2,450 or $70/mo.

Both units are microprocessor-controlled, Extel said.

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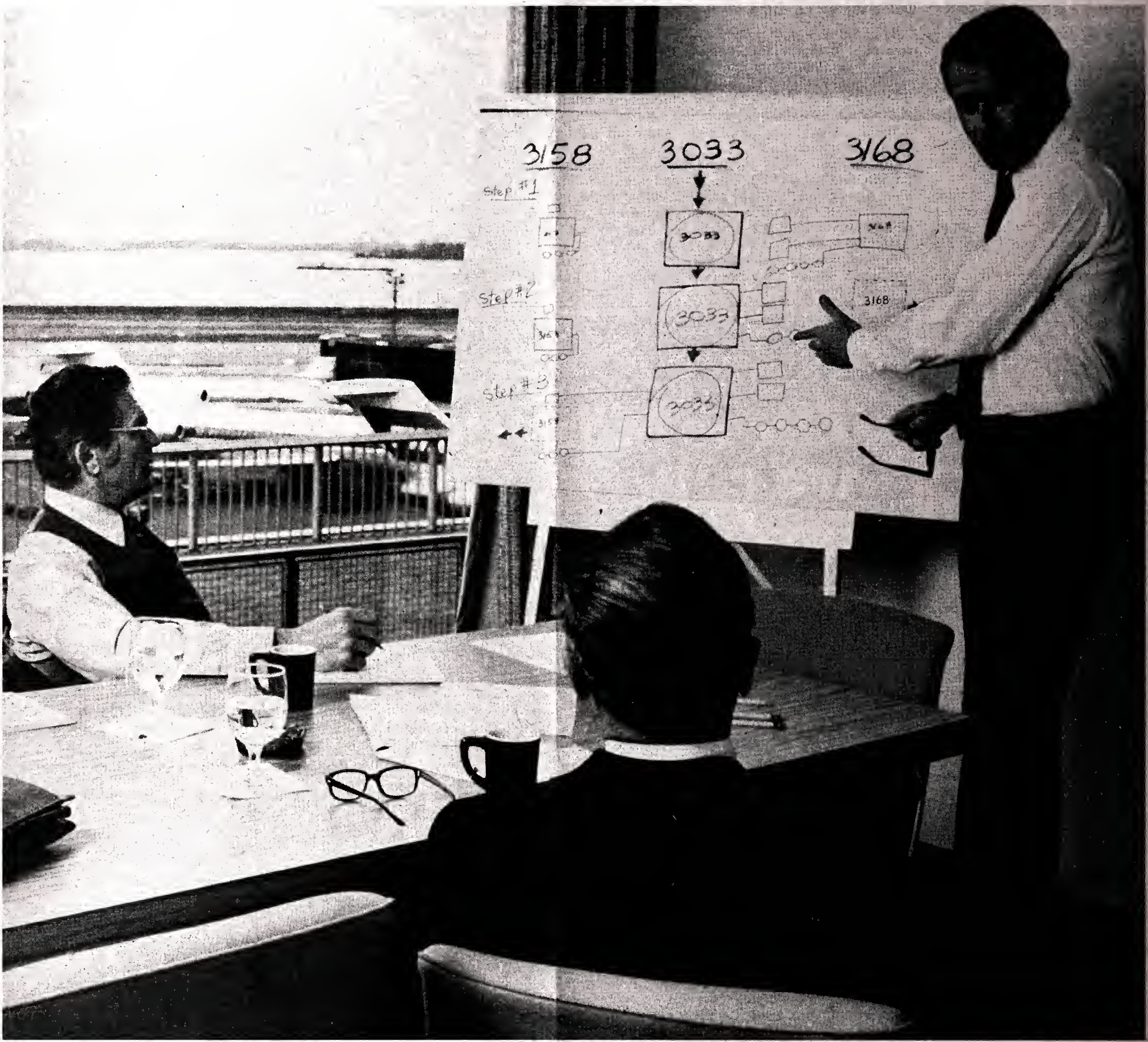

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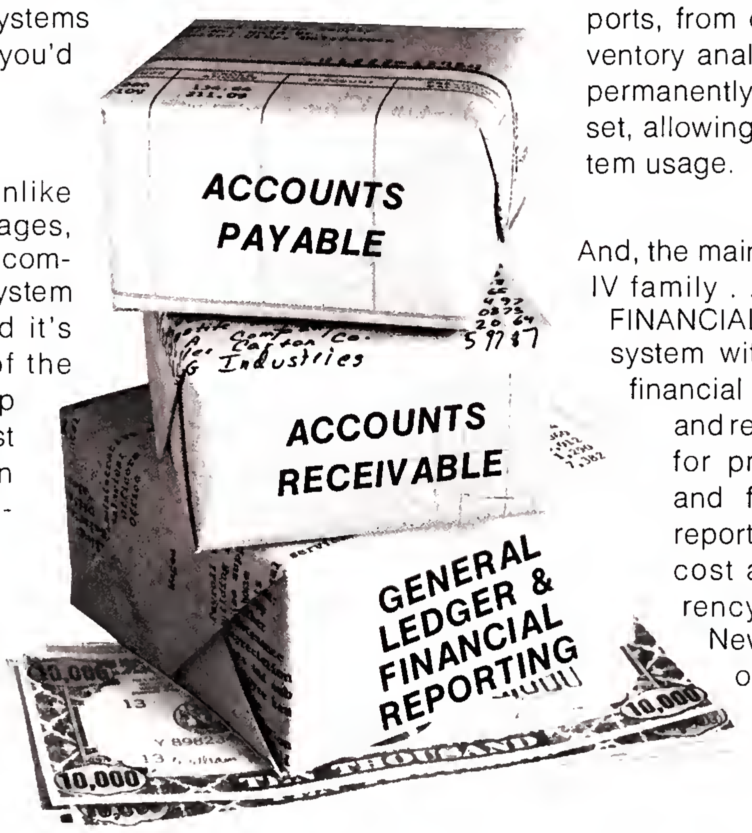

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Citibank Protests Choice

New York State Awards MMIS Contract to Bradford

By Ann Dooley
Of the CW Staff

ALBANY, N.Y. — Bradford National Corp. has been selected to design, develop and implement a Medicaid system for New York State and that choice is being protested by Citibank of New York, another contract bidder.

In a letter to Philip Toia, New York State commissioner for social services, Citibank requested a reexamination of the contract award because it is "concerned with Bradford's ability to manage a project of this size and complexity."

Bradford was chosen over Citibank, the second leading contender, because of price, its success in its DP operations and its "impressive experence in high-volume, transaction-oriented accounts payable systems," Toia said.

The decision process was painstaking and thorough and everyone concerned is satisfied with it, according to Michael Diem, director of management information services for the Department of Social Services.

Under the Medicaid system, the state hopes to begin saving $175 million of a $250 million annual loss from fraud and mismanagement, Diem said. The system, which has been in the planning stage for some time [CW, July 17, 1976], will check both the patient and the Medicaid service provider so errors and fraud will be substantially reduced, he said.

Control of Claims Handling

Previously, each of the 58 counties processed claims separately; some were automated and some were not, and the state acted in a supervisory capacity.

With control so widely dispersed, it was possible for a patient to be on the Medicaid rolls of more than one county or to file false claims, Diem noted. And there was no way to keep doctors from "ping-ponging" patients back and forth to collect extra fees, he added.

The system will handle the submitted claims quickly at a single source and will also control all billing services. "This centralized, more efficient method should end a lot of our problems," Diem said.

The Medicaid Management Information System (MMIS) will cost $32 million the first year of the contract and about $95 million will be paid over the contract's three-year extension period. The state will then have the option of renewing the contract or taking responsibility for operating it, Diem said.

From Nothing to Everything

In preparation for this, the Social Services Department plans to expand its DP department from 200 to 1,000 employees. "Overnight we'll be going from nothing to everything," Diem said. "We're planning to put in about 1000 terminals throughout the state.

Since the new DP positions are Civil Service, "there might be a lack of [qualified] people so the pool will have to be expanded," he added.

The department hopes to minimize this personal expansion problem by extensive training and by raising the level of management and staff concern, Diem said.

The MMIS is divided into six subsystems; three will be run by Bradford and three will be under state jurisdiction, according to Diem.

The state DP department will handle the "reference" subsystem which includes fees, rates and prices for all Medicaid patient services. It will also handle the "provider" subsystem, which maintains files and identification of all doctors, hospitals, skilled nursing homes, dentists, ambulatory services and extended care facilities that service Medicaid patients, Diem explaiend.

The third subsystem under state control identifies all residents eligible for Medicaid assistance.

Bradford will be responsible for the "claims payment" subsystem, which entails handling claim receipts from the provider community and editing the data in those claims. It also helps ascertain whether the client is eligible and then pays him. "This is the most comprehensive of all the subsystems and uses all the others," Diem said.

The other subsystems handled by Bradford will be "management and administrative reports," which generates pertinent and updated accounts of the work, and "surveillance and utilization," composed of fraud and abuse determination techniques.

Added Measure of Security

Security for the system, according to Diem, will include all the usual physical safeguards. As an added measure, all potentially eligible patients will receive freshly coded identity cards every month, Diem said.

The data will be available only to the state DP department, Bradford National and the counties involved, he added.

This is the first such Medicaid contract for Bradford, which has subcontracted with The Computer Co. of Richmond, Va., for the system, according to Diem. The system is now being successfully implemented in Virginia and will be transferred to New York with various modifications, he said.

Bradford's annual revenues of $66 million will be increased by a third with this contract, Diem said. "It will be a do-or-die situation for Bradford, so it should try very hard," he added.

The Department of Health, Education and Welfare (HEW) will pay 90% of the system's development costs and 50% of the operating costs, Toia said.

If the system meets certain qualifications and HEW approves it, the agency wil pick up 75% of the operating costs, he added.

The MMIS will be implemented first in New York City and should be running in November. The entire system is expected to be implemented by November 1978.

The system is being started in New York City first because that is where most of the abuses are found, according to Toia. The current state Medicaid program costs $3 billion annually and New York City accounts for 70% of that, he said. The state makes up more than one-fifth of the nation's Medicaid total, he noted.

"The city has been running the show too long," Toia said. "The city is privy to what we do, but [with the new system] we will call those shots."

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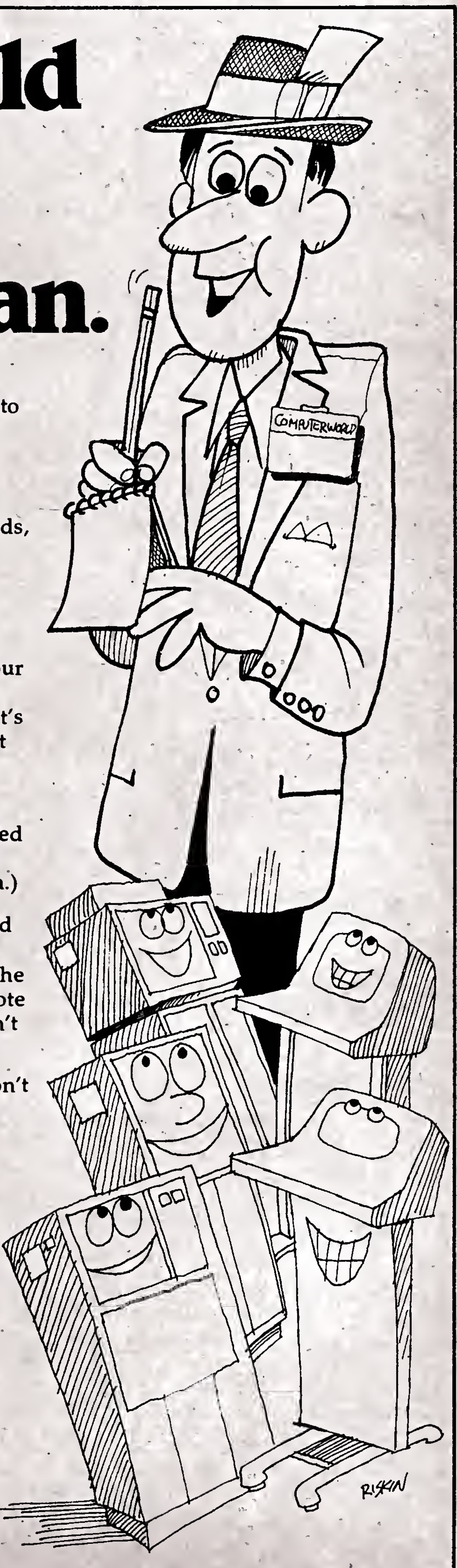

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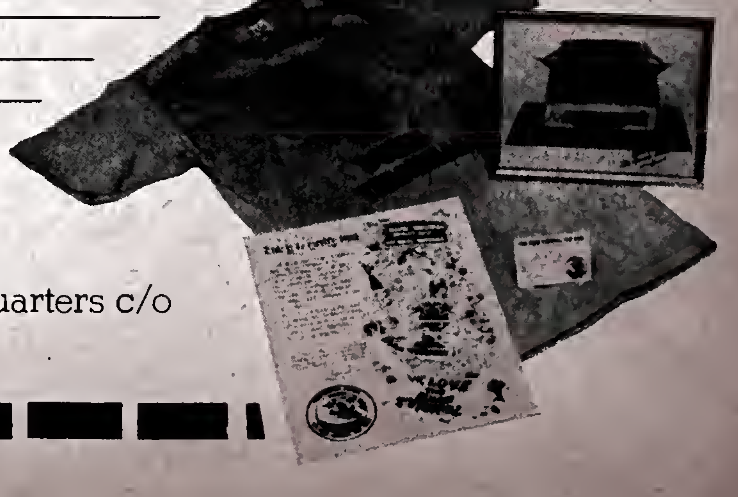

Mini Posts Prompt Results as Regattas' Scorekeeper

By Ian Wells
Special to Computerworld

A typewriter-size minicomputer scored a first in two world one-design sailing championships last year. The first race was a rugged dinghy competition on St. Margaret's Bay, Nova Scotia, and the second, a windsurfing challenge in the balmy Caribbean waters off Nassau, the Bahamas.

For the first time, racing officials at the August 1976 Rothman's World Fireball Championships produced racing results promptly, reliably and simply — all from a makeshift data center in that small Nova Scotia fishing village.

Competitors could check their day's performance soon after coming ashore and press reports of cumulative results went out almost as soon as the racing results arrived at the regatta headquarters.

1976 Fireball World Championships

The job was done by a Hewlett-Packard Co. 9825 minicomputer, comparable to IBM's 5100, set up in the rebuilt washroom of a camper trailer parked in the corner of a fish processing plant's parking lot.

Fireball sailors from around the world gathered in Nova Scotia for the International Week and then the world championship to compete against the best sailors of this exciting two-man, 16-ft. dinghy.

St. Margaret's Bay is one of the most demanding sailing sites in Canada and it lived up to its reputation with winds ranging from light to 25 knots.

The conditions were also challenging for the organizers. Up to 100 boats had to be scored each evening and results accumulated and sorted over the week. Regattas are scored with a low-point scoring system, usually counting the best six of seven races in a series for total points.

The mini allowed racing officials to post preliminary results half an hour after the day's finishing positions arrived on shore. Press reports went out right away.

After bringing their boats ashore each afternoon, sailors checked their day's performance against their competition on the most recent results sheet.

Transcription and typing errors were automatically detected and eliminated by the computer as results were typed in. If finishing positions had to be changed after the preliminary results were calculated or if a protested boat was disqualified, results were easily recalculated and reposted.

Regatta committee members learned quickly how to operate the computer to get extra copies of results, to correct spelling of sailors' names or get a sorted listed of competitors.

The safety boats and committee boats left shore each morning with the most up-to-date list of boats competing.

Computerized central data storage meant this regatta could be run without the long delays and inevitable errors in the results that sailors have come to expect at sailing regattas.

The shore site was smooth running compared to the excitement on the water. By the end of the championships, Steve Benjamin and Tucker Edmondson, both from Connecticut, soundly beat both the aggressive British team and defending World Champions Joan and Art Ellis of the U.S.

In November 1976, the computer system followed the sailing season south to Nassau, the Bahamas, and the World Windsurfing Championships. This was the largest one-design regatta ever held with over 400 competitors.

The Windsurfer — a surfboard with a sail — inspired the phrase: "Windsurfers do it standing up." The sailor stands on top of the board, holding the sail; balancing against the wind. The simplicity, portability and low cost of this boat have caused it to be enormously popular, especially in Europe.

For the regatta organizers, such popularity means a great number of boats at a world championship race. With eight races scheduled and 400 boats there are a lot of results to score.

To get the job done, I brought my software from Nova Scotia and windsurfer Jay Thomas brought his HP 9825 from California — thus forming a continent-wide computer effort.

A portable computer was especially important for the Bahamas event since time-sharing systems could not be conveniently or cheaply used.

Jay and I worked feverishly in the computer center — this time a hotel room under the palm trees next to the beach — for two days before the regatta, preparing the software and hardware for the Windsurfing regatta.

Reliability Critical

A thermal printer replaced the impact printer used in Nova Scotia. Reliability was critical. Routines were written to output results, column by column, on the auxiliary cash register-type printer built into the 9825 just in case the larger printer went down.

The night before the first race, registration forms were keyed into the computer. Entry forms had been sent from all over the world. The 9825 pulled all the information together, found the inconsistencies and transcription errors and printed a complete sorted list of entrants.

Effectively, two regattas were held — a two-day eliminations regatta and a two-day finals and consolations — with over 3,200 finishing positions to be processed.

The main problems with all this data ended up being the correction of the inevitable copying errors. They were quickly detected by the computer and then the dependable 9825 could churn out copies of results

It took longer to get the results from the race committee boat to shore than it did to calculate, print and post them.

Results were printed regularly each supper time. At the beginning of the race week, results were posted, but no one came to look at them.

No one had ever seen results posted this soon. By the end of the regatta, though, competitors demanded accurate standings right after each race.

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2) The content of these books is based on an analysis of the tasks normally required of an applications programmer. That's why these books contain everything of use to the average programmer, and very little that isn't. That's also why these books give substantial coverage to job control language. The DOS book covers DOS and DOS/VS. The OS book covers MFT, MVT, VS1, and VS2.

3) These books are organized by function. A complete subset of BAL is presented in the first three chapters of the book, and later chapters cover such functions as debugging, table handling, subprogram linkage, and file handling. When material is organized in this way, you learn more quickly because you always see purpose.

4) Each book contains dozens of complete program listings. They start with card-to-printer programs and end with programs that create and retrieve direct files. In between there are listings for routines and programs that perform code translations and input validations, set up the linkage between mainline modules and subprograms, load and use tables in storage, create and retrieve sequential and ISAM files, and so on. As a result, you will have many models of professional coding techniques upon which to build.

Content

The intent of these books is to develop a basic programming skill in assembler language. As a result, the initial emphasis of each book is on a professional subset of BAL along with the related debugging skills. If you did nothing more than master this material (chapters 1–5), I think you would justify the cost of the book several times over.

Beyond this, table handling, subroutine and subprogram linkage, and sequential and ISAM file handling are given primary emphasis. Since these are common programming functions, this material is valuable background regardless of the language you normally use.

Finally, these books show you how to write macro definitions (great background for working with software packages), how to code bit manipulation and translation routines, how to isolate the fields in free-form input data (a common function in teleprocessing programs), and how to work with direct files. This type of material starts you on your way to the more sophisticated tasks required in a computer installation.

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Bank Finds Way to Run Multivendor ATMs On-Line

By Toni Wiseman
Of the CW Staff

NEW ORLEANS — Many banks have installed on-line automated teller machines (ATM), but very few have deliberately made the decision to simultaneously place ATMs from two vendors on-line.

The vice-president of one of those that did — the Union Trust Bank in Darien, Conn. — described just such an experience to attendees of the American Bankers Association's (ABA) 1977 National Operations and Automation Conference here last week.

Union Trust installed 13 off-line Docutel ATMs in 1973 after its competition had peppered Fairfield County with Docutel Total Tellers, according to R. Thomas Strother. By the end of 1976, the bank's cardholder base totaled between 17,000 and 20,000, and the average usage of the off-line machines was 350 transactions per week per machine, or about the same as that of the competition with their on-line machines, he said.

Union Trust began its multivendor project with two matched half-megabyte IBM 370/145s. All the peripherals (3330 disks and 3420 high-speed tapes, as well as unit record equipment) were fully switchable between both systems. The bank used IBM's DOS/VS, Power/VS and CICS for audio response. It also used University Computing Co.'s Central Information File (CIF) and data base management system which, Strother said, proved useful to the bank in facilitating the expansion of CIF to handle its ATM project, but also presented problems.

"Most teleprocessing monitors will only talk to the standard IBM file access methods such as Isam or Vsam; this was an obstacle that had to be overcome, but we bit that bullet about a year or so before we went on-line with ATMs," he noted.

CW
At ABA

Union Trust's overall objective was to develop a method of reducing the incremental cost of providing more customers with better service. Management decided that by operating ATMS on-line, it could apply the computer's power to policing the use of the ATMs; therefore it could relax its cardholder standards significantly.

"By expanding the ATM user base to include virtually all our customers, we will be able to develop use of ATMs to the point where branch office lobby traffic growth will be reduced — perhaps even reversed — and therefore relieve the pressure to expand existing branch offices.

The original 13 Docutels had been installed in the western end of the bank's market area, where two-thirds of its business was located. The decision was therefore made to install seven ATMs in the eastern end of Fairfield County, resulting in an ATM within 15 miles of all the bank's customers and within five miles of most.

Problem With Vendor

The logical decision would have been to install Docutel ATMs, since the bank was familiar with the hardware and satisfied with the product. In addition, this decision would have meant a single teleprocessing protocol (Bisync) and potential software simplicity because one mainframe software package could handle the job, he said.

"But Docutel's marketing people were not very enthusiastic over our inquiries about seven new machines; they came forward with only a modest amount of advice, the sales office suffered an inordinate amount of turnover and some of the advice they supplied, such as software cost figures, turned out to be inaccurate. We lost confidence in them," Strother stated.

"IBM, which admittedly had more to gain than Docutel — we would be the first 3614 installation in the Northeast — offered a great deal of advice and bent over backward to answer all the difficult questions raised by the intrusion of a whole new line of hardware and a new line protocol into an already complex project," he said.

In addition, he indicated, IBM's product offered some advantages such as a programmable display, single-bill dispensing, dual-denomination capability, an off-host (but not off-line) capability with virtually limitless negative file capacity and huge currency capacity.

"So, despite the difficulties, we bit the bullet and committed ourselves to adding seven IBM ATMs," he noted.

Two Sets of Software

Since Union Trust had two brands of ATMs, it needed two sets of software to handle them. The bank had initially hoped Information Processing Corp. (IPC) of Houston, Texas, would be able to service both with its ATM package, "but after some initial enthusiasm it determined it would not be able to," he said.

Therefore, the bank purchased IPC's package to handle the Docutels along with the First National Bank of Nashville's Fat package which that bank had written to drive its 3614s. This was necessary because of the Synchronous Data Link Control (SDLC) protocol to install IBM's Extended Telecommunications Access Method, (EXTM), he noted.

Union Trust then tried to interface the First National system to the IPC system so management reports and the file refresh function performed by the IPC package could also be performed for the IBM terminals. Finding itself working against time, however, the bank decided to abandon the effort and instead run the two systems independently.

Incompatible Communications

The IBM machines were SDLC, the Docutels bisynchronous. This meant the bank had to have separate lines and protocols to handle them.

For front ends, an IBM 2701 was installed to service the bisynchronous devices and the Docutels were divided into two lines, he said. For the IBMs, a 3704 using the Network Control Program was installed. The 3704 would in turn service a 3601 Finance Communication System minicomputer located at headquarters in New Haven, he said.

The software for the 3601 was IBM's Colts, and IBM's Customized Image was installed for the 3614. No software is required in the 2701 used by the Docutels, he noted.

Different Controllers

As a result of testing, network control hardware is a 3604 teller terminal operating as a "long-range" console off the 3601 mini, but located at the computer center, he said.

In addition, the Docutels and the CPU software are controlled by a 3767 hard copy input/ouput terminal and also by a 3270 CRT, he said.

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Numerous Vendors on Hand to Greet Bankers . . .

By Toni Wiseman
Of the CW Staff

CW
At ABA

NEW ORLEANS — Numerous vendors were on hand here last week to introduce products and services for the financial field at the American Bankers Association's (ABA) 1977 National Operations and Automation Conference.

NCR Corp. unveiled a microprocessor-based selfservice terminal for use in bank lobbies and other secure areas. The NCR 1770 guides customers step by step through most routine banking transactions including deposits and withdrawals, transfer of funds from one account to another, inquiry on account status and bill paying, NCR said.

Up to eight 1770s can be linked to a single microcomputer and grouped in clusters in a lobby, according to the firm. The microcomputer can be linked to a larger central computer via an integrated asynchronous modem so transactions can be processed as they occur. In a free-standing mode, transaction data can be recorded on cassettes for later processing by a central computer.

Prices for the 1770 terminal range from $13,000 to $15,000. The price of the microcomputer unit, which controls up to eight terminals, begins at $11,170.

In typical configurations ranging from four to eight terminals linked to the microcomputer, the cost per terminal ranges from $14,500 to $18,000, according to NCR. First deliveries will be in the fourth quarter from the firm in Dayton, Ohio.

Three From Burroughs

Burroughs Corp. introduced three products including the TD 730, a self-contained terminal system with an 840-character display capacity designed for any input and display function. The terminal is priced in the $3,500 range, a spokesman said.

The TD 830 is an enhanced version of Burroughs' previously released TD 820 and offers greater screen capacity and more buffer.

The TD 830 features a 1,920-character screen and 6,000 bytes of memory.

Designed as a slave device to the host, the CRT is not programmable but will allow the user to change certain conditions via the keyboard such as transmission rate, the spokesman stated. The TD 830 is priced in the $4,500 range, he added.

The AP100 is Burroughs' financially oriented high-speed printer capable of operations at up to 90 char./sec. It was designed to allow a teller to operate a passbook function off a CRT and is priced at about $6,000, the spokesman said.

Bunker Ramo Corp. unveiled its Financial Transaction Terminal (FTT) designed for use at point-of-sale (POS) locations.

The FTT provides a variety of services to the consumer at checkout and courtesy counters including check verification and guarantee for approval of personal, payroll and government checks; deposits; withdrawals; and transfers and inquiries to and from checking, savings and card accounts in an electronic funds transfer (EFT) environment as well as payments to card and club accounts, utilities and loans.

Modular Design

The FTT is modular and self-contained, has a 12-digit numeric display and features a 24-key data entry keyboard including 12 function keys. It also features interactive tutorial prompting and system responses.

Optional features include a card reader, PIN pad and a printer.

A complete POS system consists of multiple FTTs on-line to a host CPU. The terminals may be connected to the primary communication circuits directly or through one or more Bunker Ramo programmable control units which serve as intelligent concentrators for remote or local multidropped FTTs.

The basic price of the terminal with an integral transaction card reader is less than $1,000 and with a receipt reader less than $2,000, the firm said. It is located at 35 Nutmeg Drive, Trumbull, Conn. 06609.

IBM introduced its 3614 consumer transaction facility, an unattended self-service terminal that accepts customer identification and transaction data and issues variable amounts of paper currency and travelers' checks. The terminal is available as a lobby or a through-the-wall model with varying capabilities.

Up to 999 special functions are programmable, a spokeswoman said, noting an average full-

(Continued on Page 17)

Distributed Confusion

There are almost as many approaches to distributed processing as there
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This all-around performance makes the HP 3000 an ideal departmental computer. You can dedicate it to solving a wide range of problems such as order processing, inventory control, cost accounting and materials requirement planning.

You'll see a dramatic improvement in efficiency at your plant or sales office or distribution center. At the same time, you'll have a better data entry system with the capacity to edit and check data before transmission to the central computer. By reducing inaccurate entries, you can shrink your communications costs.

Our system is also easy to expand, either within a department or into a complete network of computers that share information and programs.

Putting an entire network of computers at your fingertips.

We've developed new software that turns a series of HP 3000s into the simplest, most functional network available today. You can sit down at a terminal and use the programs, files and data resident in any interconnected HP 3000. You don't need a special program to do it, either. Simply identify the computer you want to talk to and you're on-line.

With the same ease, you can shift programs and files from one HP 3000 to another. And you can do local and remote processing at the same time.

Imagine how much faster remote sites can get accurate, up-to-the-minute information this way than they could by depending on the overworked central computer!

How a small computer handles big computer jobs.

The HP 3000 has versatile executive software that manages all the computer's resources. Advanced design gives it the speed and power needed to handle more jobs more quickly than comparably priced computers. (Our U. S. prices start at $110,000.)

While you're getting information from the computer on one of the terminals, the system can be running batch programs.

You can also use as many as six "big computer" languages, run large programs on our small system and develop software quickly and inexpensively. (A very important consideration when you look at the climbing costs of programming.)

The executive software is so advanced that it will remain the heart of our computers for years to come. So you can keep adding to your system without having to throw your old programs out the window.

And the built-in flexibility of the HP 3000 helps you stay up with all the latest trends, no matter what direction distributed data processing takes in the future.

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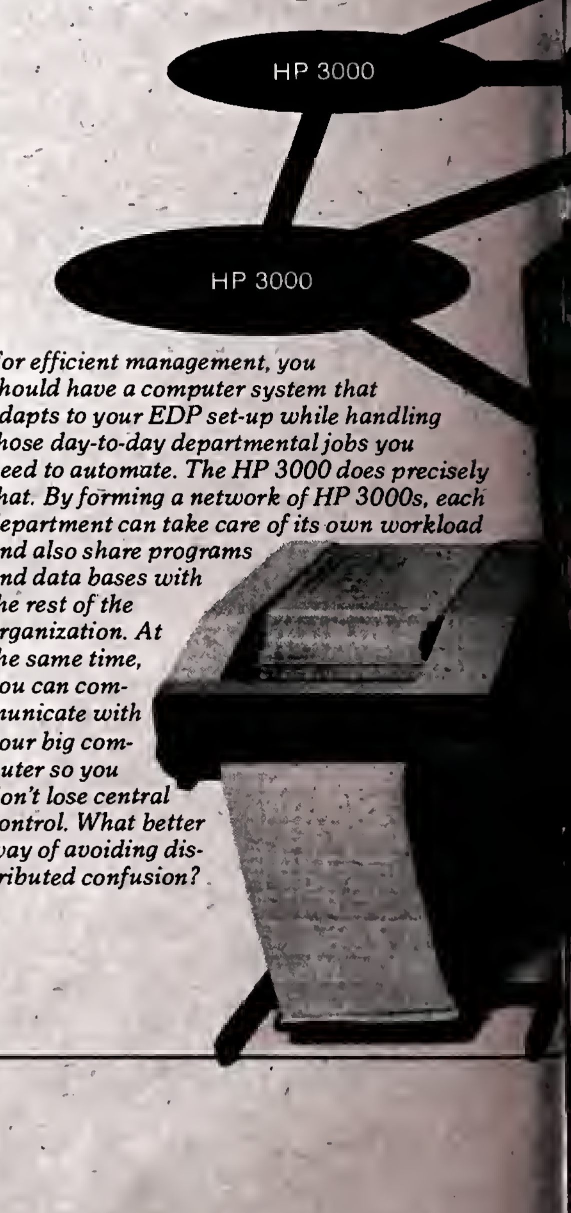

For efficient management, you should have a computer system that adapts to your EDP set-up while handling those day-to-day departmental jobs you need to automate. The HP 3000 does precisely that. By forming a network of HP 3000s, each department can take care of its own workload and also share programs and data bases with the rest of the organization. At the same time, you can communicate with your big computer so you don't lose central control. What better way of avoiding distributed confusion?

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(Continued from Page 16)

function system costs $35,000 to $37,000. The 3614 is available for purchase or on 30-day or two-year leases.

Incoterm Family Grows

Incoterm Corp. introduced the latest member of its Series 7700 family, the Model 7711 integrated banking facility, a wall-mounted customer banking device.

Designed for interior or exterior installation, the unattended terminal provides full customer transaction interface including cash handling for less than $2,000, according to the firm located at 64 Walnut St., Wellesley Hills, Mass. 02181.

Quantor introduced its Q118 minicomputer-controlled computer output microfilm recorder/processor with 10.2M bytes of disk. Input formats include 9-track phase-encoded 1,600 bit/in. and NRZI 800 bit/in.; and 7-track NRZI 800 bit/in. and NRZI 56 kbit/in.

Tape read speed is said to be 45 in./sec, or 72,000 char./sec. The Q118 features automatic conversion from 132- to 160 char./line and from 64- to 86 line/page.

The system ranges in price from $140,000 to $160,000 depending on options, the firm said from 520 Logue Ave., Mountain View, Calif. 94801.

Micr Systems

Cummins-Allison introduced a line of Check Processing Systems (CCPS) for banks and bank processors. The Series 2416 CCPS are remote magnetic ink character recognition (Micr) systems for banks with limited volume that still desire complete point-of-deposit and data capture capability. They operate on-line to a CCPS minicomputer which permits key correction of rejects at CRT/keystations.

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The systems support 125- to 600 line/min printers, 2.45M- to 39.2M-byte disk storage, 7- or 9-channel tape drives and 2,400- to 9,600 bit/sec communications controllers.

The top-of-the-line Series 5416 systems can be configured with 13- and 26-pocket machines that read both Micr and optical character recognition code. The latter is available with ink jet printing and microfilming capabilities. These also operate on-line to a CCPS minicomputer which supports a full range of I/O devices.

Prices are available from the firm at 800 Waukegan Road, Glenview, Ill. 60025.

Bank Computer Network Corp. (Bankcom) introduced an automatic teller which performs most common banking transactions and also dispenses first class postage stamps, which are charged directly to the customer's account. Bankcom is located at 10501 Delta Parkway, Schiller Park, Ill. 60176.

Service Offerings

In the services area, Periphonics Corp. announced Bank-From-Home, an automated system that provides commercial and thrift organizations with EFT capability. The service permits the transfer of funds directly by the consumer using any standard 12-button Touch-Tone phone.

Periphonics also announced support for the IBM 3600 financial terminal series through its T-Comm 7. T-Comm 7 support of the 3601 controller is said to allow the mixing of 3600 series terminals in a single network with other devices selected from the spectrum of Periphonics terminal support capabilities.

In addition to the full-duplex Synchronous Data Link Control (SDLC) communications link, T-Comm 7 employs the logical protocol of Systems Network Architecture to control the 3601; however, existing host monitors in IBM and other vendors' mainframes may be preserved without modification, the firm said. Periphonics is located at 75 Orville Drive, Bohemia, N.Y. 11716.

Software Package

University Computing Co. announced its plans to offer "The Bill System," a software package for banks and thrift institutions that allows their customers to pay routine bills by telephone. The Bill System was acquired from the Louisiana National Bank in Baton Rouge, La., which developed the software.

The package allows entry to the system via both touch-tone and rotary telephones and uses limited-access identification numbers for security and privacy.

The package will be available within the next few months from the firm at 8303 Elmbrook, P.O. Box 47911, Dallas, Texas 75247.

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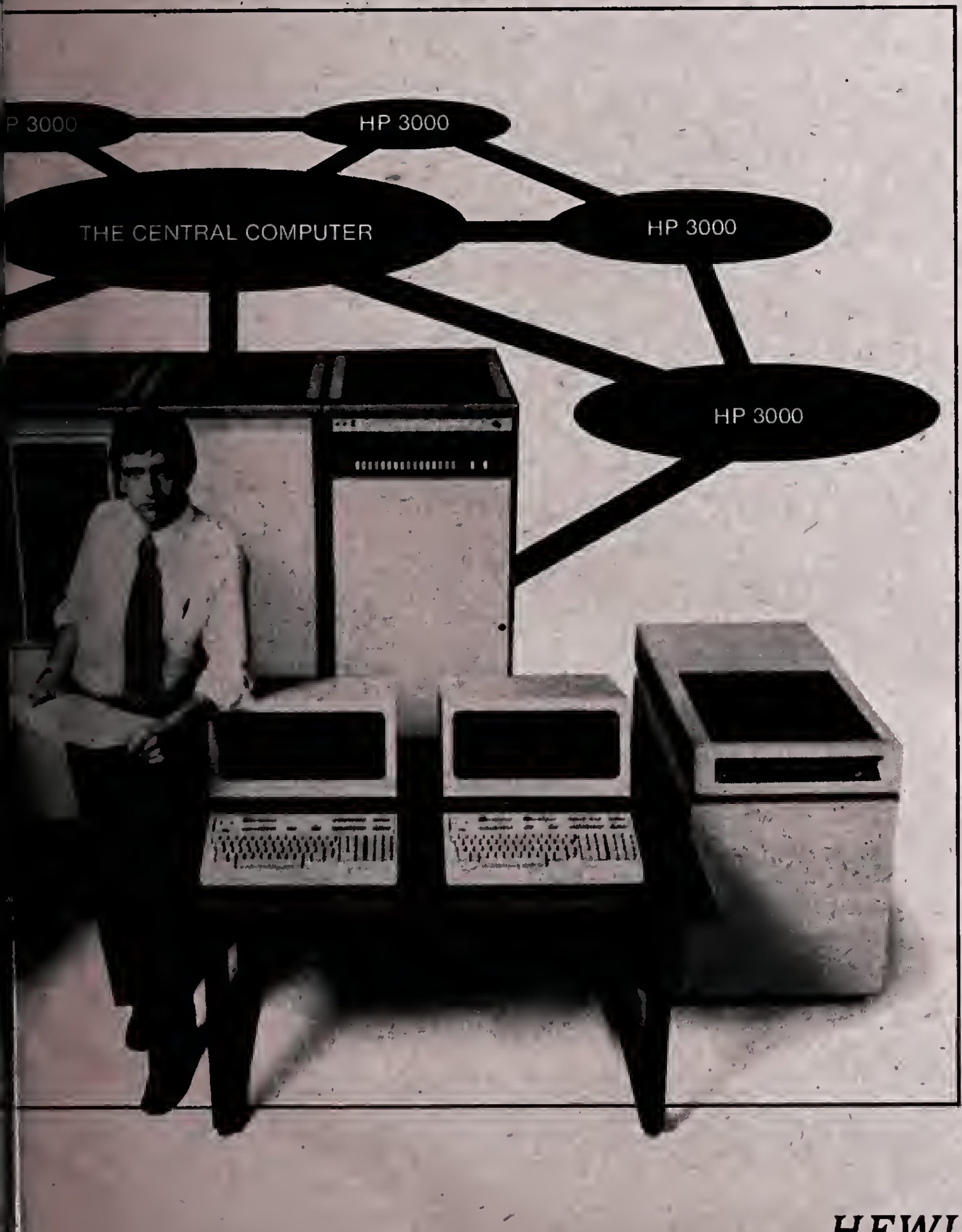

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The Waves of Change

By Charles P. Lecht

Where are DP vendors spending their R&D dollars now? And what will this mean in the years ahead? This week, Lecht explores the manufacturers' spending emphasis and trends for the future.

CHAPTER IV

The major data processing manufacturers face an expanding range of possibilities in planning the investments and disbursements that will establish them in the most profitable and promising markets of the 1980s. The difficulties that they must overcome in planning their spending strategies do not arise from lack of information concerning individual markets, although the quality of that information may be questionable in certain areas.

Rather, their problems stem from the need to decide *which* of those markets are the right ones for them to be in. Every market and product decision entails its own risks for which a company, by reason of its technical, financial and/or other limitations, may prove to be inadequately prepared.

Apart from an IBM or an AT&T, few manufacturers can afford the luxury of both expending their resources on multiple products in nearly all market areas and of generating and maintaining "second front" plans/products with which to meet all contingencies as well.

Expenditures and Opportunities

General-purpose computer systems as we know them today in the small- to large-scale areas are expected to grow at an annual rate of 9% to 11% nationally and nearly 15% worldwide for the next few years. In contrast (as stated in Chapter III), general-purpose programmable terminals are projected to enjoy a 30% to 35% compounded growth rate. Also, specialized point-of-sale (POS) or electronic funds transfer systems, among others, should climb at a 35% to 45% dollar growth rate.

Small business computers such as the Univac BC/7, Burroughs B80, IBM System/34, Honeywell Level 6 and others produced by such worthy contenders as Digital Equipment Corp., Data General, Interdata, Hewlett-Packard and Olivetti should grow at a rate in excess of 30%.

The relative distribution of these growth rates suggests at least the possibility that some manufacturers may be in the wrong market. For example, they could be concentrating most of their resources on the general-purpose mainframe area, which has a relatively lower growth rate, or dissipating their limited resources in a number of areas with no clear idea of where to focus their corporate resources.

While a given market, such as that for general-purpose and applications-specialized intelligent terminals, may promise a relatively high growth rate, it is also likely to be characterized by intense competition and rapidly falling prices. Thus, there are present all the elements of a Waterloo for a firm which lacks sufficient financial staying power or research and development resources to compete in this arena.

As a further example, the small business systems and minicomputer market has a relatively high growth rate; however, it also involves a great deal of customer handholding, marketing expense and software investment which few firms are capable of handling profitably. Ostrich-like, first-time users may ultimately be the victims of naive entrants into this marketplace.

Research and development budgets usually (but not always) reflect individual corporate decisions as to which market and specific budget(s) or business(es) to be in. At the same time, R&D budgets are frequently used for purposes not necessarily in the interest of the parent company.

Lack of emphasis on or adequate spending levels for promising equipment or applications, overly narrow goals or excessive experimentation are some examples of the inherent risks. Also, triage seems a common method of investment planning. Thus, many projects with initial financing are left to wither as committed funds are exhausted.

Finally, the guillotining of worthy projects prior to their maturation as a result of management jitters is a more prevalent mode of decision making than most would care to admit.

Without being privy to the internal budgets of the various manufacturers, we may reach certain conclusions from the recent flow of product introductions and other information in the public domain. IBM's apparent No. 1 priority is I/O devices, such as disk files, laser printers, mass storage subsystems and so forth, while No. 2 is probably software, including operating systems enhancements, new operating system development and applications software.

The third-ranked priority would appear to be mainframes, covering all categories from the System/32 and the 5100 all the way up to the super-large-scale 3033 and its about-to-be-announced multiprocessor versions. No. 4 is likely to be components development, including logic and memory circuits and packaging. No. 5 is the new communications satellite venture, as well as terminals, multiplexers and concentrators.

No. 6, the "all other" category (also a major growth area), includes office products, word processing, copiers, etc. Finally, in our estimation, priority No. 7 at IBM is pure research; it will come as no surprise that few, if any, other vendors can afford to invest the estimated $100 million (or 10% of a total $1 billion R&D budget) on *pure* research that IBM is believed to have spent in 1976.

While communications is of relatively low rank at this writing, it probably has a higher growth rate in R&D expenditures at IBM than the other categories.

Burroughs, Univac Similar

In contrast, Burroughs apparently is spending most of its limited R&D resources on mainframes of all types, e.g., the B800 series, followed by communications terminals and controllers. Its third-ranked priority is evidently software, including new MCP operating system versions and business applications packages, with I/O devices probably ranking fourth and "all others" (including word processing) fifth.

Components represent a relatively small current R&D activity at Burroughs, but nevertheless an important one — about 30% to 40% of its logic and IC storage needs are internally met.

Univac's key priority (like Burroughs') appears to be mainframes, followed by software, where it reportedly is spending in excess of 50% of its R&D budget (on operating systems extensions and system software enhancements, as well as other essential packages).

Priority No. 3 is probably I/O devices (at its Information Storage Systems Division); No. 4 is believed to be communications and terminals, including network processors and remote concentrators.

Finally, No. 5 is probably the components area. Univac, like many other vendors (except IBM), depends to a great extent on outside suppliers for most of its IC components. Since developments in IC component technology are occurring at a rapidly accelerating pace, the absence of significant internal investment in IC manufacturing may prove to be an advantage — or at least not a disadvantage.

Emphasis at Honeywell

Lately, Honeywell seems to be giving greater attention to applications and operating systems software, while its second level of priority appears to be occupied by mainframes of all types, including minicomputers and word processors. Probably next in order is I/O devices, although Honeywell gets many of its magnetic and other media-type devices through its joint peripheral venture with Control Data Corp. and International Computers Ltd. Communications and terminal emphasis is followed by component development, with modest R&D funds spent on pure research.

DEC is clearly spending most of its R&D budget on mainframes to support its dominant position in the minicomputer market, followed by a more recent emphasis on software. I/O devices represent the third most important area, followed by communications and terminal products.

More recently, DEC has been improving its vertical integration by developing in-house components capability.

Unlike the above-cited domestic manufacturers, NCR has continued to place its emphasis on POS terminals for its traditional banking and retail marketplaces, while reinvigorating its processor technology. Its introduction of a complete new line (the 8000 series) would suggest that the company intends at least to maintain its market share in the small- to medium-scale mainframe business.

Of equal importance to NCR lately is its software situation, which is commanding a greater share of its management's attention and R&D funds.

The above six characterizations cover more than 90% of the computer systems manufacturers' R&D expenditures being made at this time. The omission of such noteworthy firms as Amdahl, Fujitsu/-Hitachi, Data General, Olivetti, Siemens, ICL, etc. from the above discussion is intentional, but in no way designed to reflect upon their importance.

For one thing, most of the larger foreign companies are subsidized by governmental monies and their budget priorities are therefore difficult to identify. As for domestic companies, further data would not significantly alter the overall trends already described.

If one were to add up all the 1976 research and development expenditures of all the above-listed vendors (and many others), they would not equal IBM's R&D expendi-

(Continued on Page 20)

Figure IV-1. DISTRIBUTION OF IBM MAJOR COSTS AS A % OF REVENUE

IBM 370/135 MAINFRAME COSTS				ESTIMATED IBM 370/138 COSTS
18.5%		Manufacturing		12.5%*
7.2		Customer Engineering Support		2.2 **
1.1		Engineering		2.5
0.5		Reconditioning		0.8
0.3		Scrap & Rework		0.5
0.7		Other		0.7
38.7		Corporate Apportionment		38.7
5.4		Profit Contingency		5.4
72.4%	=	Total Cost	=	63.3%
27.6%	=	Gross Profit	=	36.7%

*Lower cost due to bipolar replacement with 2K MOSFET chips.
**CE cost is essentially covered by unbundling charges.

SOURCE: IBM 370/135 Graybooks (Telex Trial Exhibit)

Excerpts From *The Waves of Change*

(Continued from Page 19)

tures for the same year. While this is an impressive (if not entirely unexpected) statistic, it is perhaps less significant than the implication that IBM is capable of continuing new product/new version introductions, which in turn compels the others to react, thereby dissipating their already meager resources.

IBM's vast market research and product planning organization is better acquainted with the general user requirements for the 1980s than anyone else. Since its development arm participates very actively in most user meetings which occur throughout the world semiannually, and its market research program is so extensive, it is better equipped to ride the waves of change.

In fact, in view of its dominating position, IBM may be creating the very waves it rides. While few other vendors can afford a sizable investment in marketplace analyses, the question is, can they afford not to? It would appear that selectivity and depth are preferable to attempting to cover the whole industry.

When General Electric announced its intention to compete across the board with IBM in the late '60s (just before it sold its business to Honeywell), this tended to reconfirm, in the minds of some industry watchers, the validity of Russell's remark, to wit: a hero is a person who hasn't examined all of the facts.

> *'A glaringly obvious deficiency in the quality of support frequently occurs even before the vendor/customer product relationship is firmly in place: the failure of salesmen or analysts in the field to properly configure the systems they propose . . . '*

For example, some competitors today are unnecessarily wasting precious resources on the enhancement and maintenance of old operating systems and other software. Many of these are, as McLuhan observes, looking forward through a rearview mirror.

Other DP suppliers may be too narrowly focused — spending most of their funds on developing special-purpose terminals or other more exotic, nonstandard and low-volume products. Still others have spread themselves too thin, dissipating their resources on every type of exotic device, some of which may, in fact, be important, but others of which are of less moment in the marketplace. As a result, they lack sufficient funds and the requisite "critical mass" to accomplish any single major goal.

The Hardware Dollar

Obviously, IBM enjoys cost advantages at almost all stages of its activities. This is most noticeable in manufacturing, where economy of scale is critical.

IBM's advantage is even greater where its software sales dollar is concerned. Its internal software development costs are spread across so wide a customer base that profitability of any single product is almost guaranteed. This is especially the case in view of the cheapness of manufacture of completed software products, whose prices reflect value received rather than production cost.

Faced with IBM's greater volumes and market share, other computer vendors really have only one course to follow: to divest themselves of all nonessential activities and redirect and focus their limited resources to support the key aspects of their businesses.

Figure IV-1 is a summary of the breakdown of the IBM 370/135 mainframe costs based on the IBM Graybook which was an exhibit in the Telex trial. You may note that manufacturing represented about 18.5% of the cost (as a percent of revenue). We estimate that the new model 138 with the lower cost MOS (instead of bipolar) storage allowed IBM to reduce this cost to about 12.5% of revenue.

The bottom line indicates that IBM's total costs for this product were 72.4% of revenue, declining to roughly 63.5% for the new model 138 with an estimated profit before tax of 36.7%. This is consistent with speculation that IBM may at times have been operating at 40% profit (before taxes). In 1976, it reported nearly 30%.

Manufacturers are beginning to deemphasize hardware engineering and production (see Chapter II). This has been caused not only by a shift of emphasis from hardware to software, but by their realization that some low-volume products can best be bought outside from specialized concerns. The NCR, CDC and ICL peripheral activity is a good example of this sort of shift in emphasis. We would expect other, perhaps communications terminal-oriented, ventures of this ilk to also flourish in the 1977-80 period.

Better software and services are far likelier to sell computers these days than higher processor speeds. Firms which do not have IBM's current billion-dollar research and development budget, take note!

Configuration Deficiency

A glaringly obvious deficiency in the quality of support frequently occurs even before the vendor/customer product relationship is firmly in place: the failure of salesmen or analysts in the field to properly configure the systems they propose, i.e., to fit the applications or performance levels to the requirements of the customer.

NCR's Computerized Order Preparation and Network System (Coins), developed by Stephan Rothschild of the General and Applications Software Development Department and recently touted in the news media, is one of the first on-line systems available to a sales force (NCR's own) to support better configuring.

Surveys have indicated that greater user support is badly needed at all levels. This need, however, is most obvious at the low end of the business computer area. There, a desire exists to leave applications software to local software houses and supply only essential systems software or "tools."

This was apparently the strategy of DEC and others although, according to some analysts, DEC is not yet really a *full* participant in the "business computing" market, no matter how often or how wistfully it talks about it.

IBM Forecasts

The table in Figure IV-2 shows IBM's forecast of product life, revenue, profits and margins for many key items; i.e., 370 mainframes and popular I/O devices. (Some of this information comes from the IBM Graybooks which were part of the Telex Trial exhibits).

Column one shows the variation in *forecast life* for different products, which is considerable (actually there are many product lives; i.e., forecast rental life, pricing life, physical life, economic life and committee rental life). Generally, products with an earlier expected *total* obsolescence will also exhibit a lower forecasting life; e.g., the original 3330-1 disk was first shipped (approximately) in July 1971 and actually replaced with the 3350 disk subsystem shipped in approximately March 1976, or nearly 56 months later (compared with the forecast life of 58 months).

Another example is the 370/145, which was initially shipped in July 1971 and subsequently obsoleted by the Model 148 (which was scheduled to be shipped by about January 1977 — approximately 67 months later or exactly on target). In fact, the 145 rental life is somewhat longer, since 145 customers will gradually upgrade to the 148 (depending on availability schedules), and many will stay with the "old" 145s because of the purchase option credits and recently discounted purchase price.

In addition, the models 158 and 168 have a very low 46-month forecast life because most (estimated at more than 80%) of the mainframes in this class are purchased outright. Assuming IBM's forecast life is nearly accurate for these models, one could expect the announcement of a successor to the 158-3 by the third or fourth quarter of 1977 (Model 3032?).

The 168-3 upgrade model, the 3033, was announced in the first quarter of this year. A multiprocessor version of the 3033 is also anticipated by year-end.

(Continued on Page 21)

Figure IV-2. IBM 370 PRICING & PROFIT MARGINS

	MODELS	(1) FORECAST RENTAL LIFE (MONTHS)	(2) REVENUE ($ MILLIONS)	(3) PROFIT ($ MILLIONS)	(4) PRE-TAX MARGIN (%)
135	Mainframe*	70	2,034	723	35.5
145	Mainframe	67	2,293	806	35.1
158	Mainframe	46	1,663	578	34.8
168	Mainframe	46	1,255	310	24.7
3211	Printer	67	594	168	28.3
3811	Controller	67	301	108	35.7
3360	Memory	56	760	302	39.7
3330	Disc	58	1,639	554	33.8
3830	Controller	57	959	391	40.8
3420	Mag. Tape Drive	58	1,360	365	26.9
3803	Controller	58	464	108	23.3
	TOTAL		$13,322	$4,413	33.1%

*Mainframe includes -- CPU, memory, I/O channels and required features (excluding I/O devices, program products, etc.)

SOURCE: IBM Graybooks (Telex Trial Exhibit)

Figure IV-3. PRICING -- 370/145

	REVENUE ($ MILL)			PROFIT ($ MILL)			MARGIN (%)			INCREMENTAL MARGIN (%)
	Forecast Life	Pricing Life	Variance	Forecast Life	Pricing Life	Variance	Forecast Life	Pricing Life	Variance	
CPU, Memory, Features	2,293	1,817	476	806	545	261	35.1	30.0	5.1	54.8
Tape	586	464	122	183	124	59	31.2	26.7	4.5	48.4
DASD (Disc)	776	615	161	329	237	92	42.4	38.5	3.9	57.1
Printer	385	305	80	162	115	47	42.0	37.7	4.3	58.8
Card	143	113	30	38	25	13	26.4	22.1	4.3	43.3
Communications	167	132	35	50	33	17	30.0	25.0	5.0	48.6
TOTAL	4,345	3,446	904	1,568	1,079	489	36.1	31.3	4.8	54.1

SOURCE: IBM Graybooks

A Soon-to-Be-Published Book by Charles P. Lecht

(Continued from Page 20)

Column four shows IBM's expected pretax margins; e.g., 33.8% for the 3330 disk and 40.8% for its 3830 controller, while the 3420 tape drive pretax margin is only 26.9% (perhaps reflecting the plug-compatible impact on profit levels). The bottom line of 33.1% is the weighted total margin for all products in this table. In our judgment, these figures are pretty much on target.

A note of caution is perhaps in order. The forecast life should not be taken too literally, as other factors such as competitor developments (Amdahl/Fujitsu, etc.) and planned/unplanned "mid-life kickers" (enhancements) can shorten or extend the forecast rental life of a product.

Recent examples include the attached processor 158/168, 3705 version II and the 3330-11, all of which extended the product rental life.

Expectations for System

The next table (Figure IV-3) indicates IBM's expected revenues, profits and margins for the 370/145 *system*. Note that both pricing life data (based upon a 48-month nominal average life expectancy) and forecast life data, which is based upon IBM actual expected life forecasts, are shown.

For the total system, note that forecast life revenues of $4.345 billion exceed the pricing life revenues of $3.446 billion by 26%, which implies about a 60-month average forecast life for the total system.

Two major 370 planning points should thus be emphasized: (a) the pretax margin on pricing life (which is somewhat proportional to constant markup over "manufacturing costs") varied from 22.1% on card equipment to 38.5% on disk equipment, with a system average of 31.3%; and (b) the incremental margins (or the difference between pricing life and forecast life) vary from 43.3% to 58.8%, with an average of 54.1%!

The high profit associated with such long-term risk leasing (i.e., over periods in excess of 48 months) made this activity extremely attractive (understandably) to IBM. Clearly, it would have accounted for a significantly smaller fraction of its planned business if it had felt itself vulnerable either to competition, or even to the impact of one or more of its own product releases!

The probable reason that the incremental margins were not even higher is that the 370/145, believed to be on 60-month depreciation, continued to absorb a substantial (albeit fixed) amount of corporate overhead.

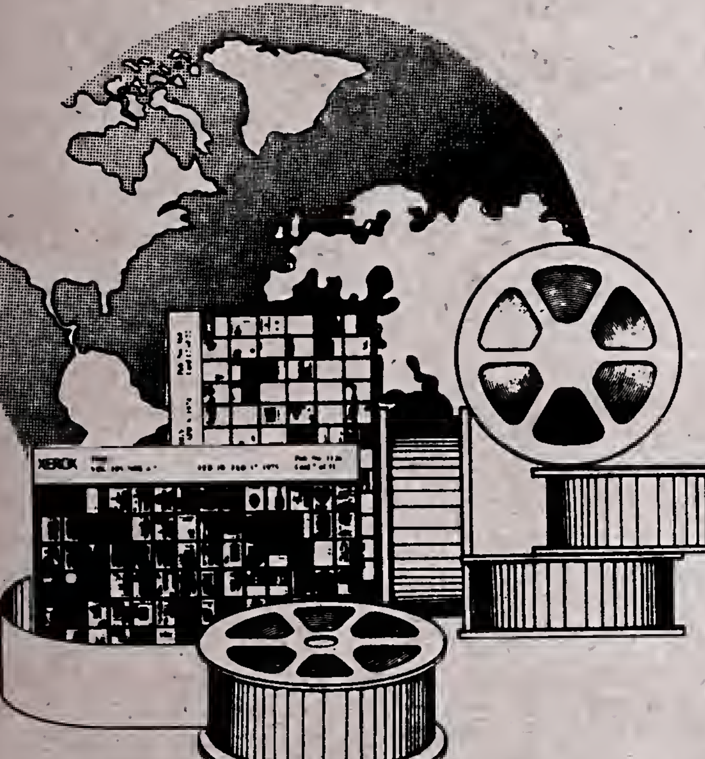
The 138 and 148 announcements and, more recently, the 3033, tend to emphasize long-term leases or purchase; the pricing relationships seem to discourage rental. Apparently rental business is too risky for IBM at this stage *or* it anticipates that the rate of technological change will accelerate over the next two to three years and it thus wishes to reduce its rental base exposures.

The new large-scale 3033 order rate is believed to have quickly built up to an incredible 2,000 units in less than two months and deliveries are extending to about the third quarter of 1979 (2,000 Model 3033s x > 4 Mips = 8 Bips; that is, billions of instructions per second).

The infusion of this enormous processing power into the world marketplace before the end of this decade may in itself be an overriding factor in molding our industry.

Lecht is the author of four previous books on computer-related matters: The Programmer's Fortran II and IV, The Programmer's Algol, The Programmer's PL/1 *and* The Management of Computer Programming Projects.

He is president of Advanced Computer Techniques Corp., which he founded in 1962, and has lectured widely for such groups as the Association for Computing Machinery, American Management Association, American Society for Information Science and Data Processing Management Association.



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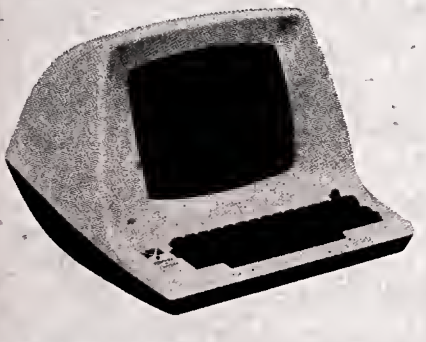

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Editorial

A Sign of Maturity

The issue of taxation of DP services and software could be one of the most divisive forces yet to strike the DP industry.

The situation could be severely trying on the cohesiveness of the Association of Data Processing Service Organizations (Adapso), which includes software firms as well as services firms.

An overall policy is difficult to formulate and promulgate for several reasons. First, representatives of even one interest group, such as software, want to have their cake and eat it too. For instance, many would prefer sales and leases of software to be exempt from sales and use taxes. The commonly used argument to achieve this is to say software is intangible.

But the software firms would also like to receive benefits, such as government aid in marketing products overseas, that are accorded to products considered tangible property.

Products must be tangible in order to qualify for investment tax credits. If there were a change in the current accounting principles that prohibit firms from capitalizing software development and thus taking the investment tax credit, the tangible/intangible classification could be a real concern.

The situation among the software vendors thus is unclear, but the water becomes more muddied when one considers the plight of the services firms and their stands against software and services taxation.

When push comes to shove and both segments of the industry are backed up against the wall, it is likely that each sector will be amenable to compromising where the cost to it is least.

There is little question the services firms are adamant in opposing what they consider to be a "retroactive" tax on their services.

Although software firms frequently have a clause in their contract indicating the customer bears responsibility for any taxes, the situation is different with services firms. Much of their work was completed a long time ago, without any such clauses in the bills, and collecting would be unrealistic — if not impossible, some say.

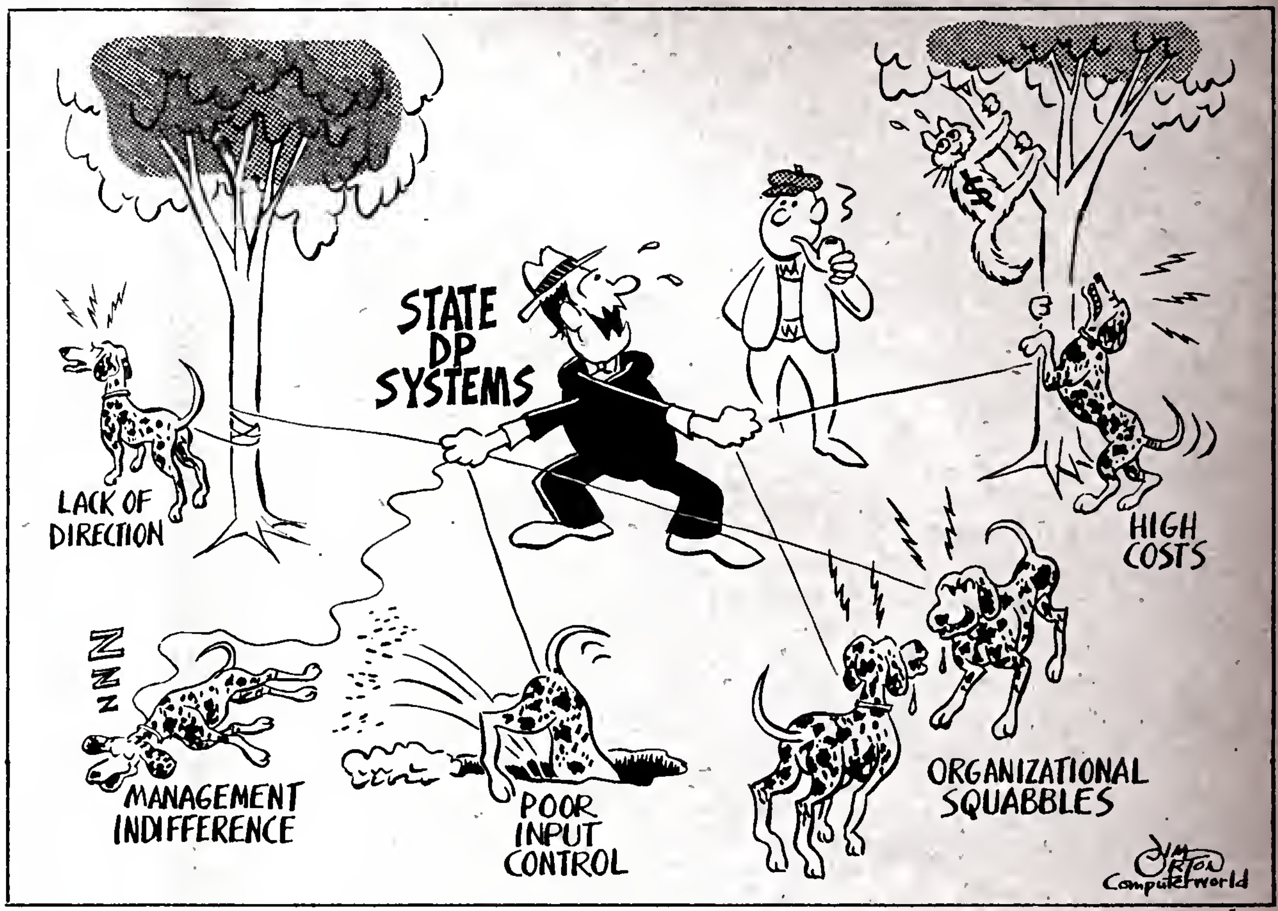
Furthermore, the services firms feel they will be at a competitive disadvantage if their prices are inflated with sales taxes since their primary competitor is often the in-house system.

Aside from the intangible vs. tangible and software vs. services aspects of the taxation issue, various states' efforts to levy taxes on services transmitted over communications media from one state to another may be in violation of laws governing interstate commerce, sources indicate.

A resident of Massachusetts who orders a fancy socket wrench from a mail order outfit in the State of Washington does not pay Washington's sales tax. But some states are attempting to tax DP services received on a terminal in one state from a mainframe in another state.

There is little question the DP industry's revenues are growing, as is awareness by states that our industry represents untapped tax revenues.

Perhaps what the industry should do is accept the fact that taxes come with maturity and concentrate its efforts on fighting those aspects which are clearly discriminatory and deleterious.



'. . . Nothing Much. What's New With You?'

Letters to the Editor

Vendors Given Many Opportunities To Review Their Survey Responses

In his letter ["Setting Statements Straight," CW, April 25], William M. Shaffer of IBM pointed out what he believed to be one error and two misleading statements in the article "Survey Finds Vendors' Hardware Support Varies" [CW, April 4].

We fully appreciate the concern Shaffer has regarding the influence our report may have on potential customer decisions. Auerbach Publishers, Inc. accepts full responsibility for the content of its "Special Report on Minicomputer Vendor Policies."

However, I must point out that the 11 vendors we surveyed were given every opportunity to review the survey responses. Auerbach took every reasonable step to ensure an accurate report and gave each vendor numerous opportunities to correct its own profile.

The following steps were taken for each vendor:

- A survey completed using Auerbach's available in-house documentation.
- Each completed survey was sent to an appropriate company representative for review and revision.
- Included in our correspondence was a letter explaining that we wanted their cooperation and we would publish the information for all 11 vendors at a later date.
- Follow-up phone calls were made to encourage vendor responses. If the survey representatives wished to respond to the survey by phone, we accommodated their request.

In the final analysis, our report is accurate, timely and important to the user. We stand by it.

Michael Negin
Editorial Consultant

Auerbach Publishers, Inc.
Pennsauken, N.J.

Another Software Saga Episode

The plaintive cries of Robert M. Sherin in his article on the new Tennessee statute taxing software programs ["Tennessee Law Taxing Software Violates the Division of Powers," CW, May 9] was merely another episode in the saga of do-it-yourself law in the computer industry.

What the Tennessee legislature did in expanding the definition of tangible personal property to include some attributes of software programs might be ill-advised or downright stupid, but it probably isn't illegal, let alone unconstitutional.

The California legislature did the same thing in reverse, at the behest of the industry represented by the Western Electronics Manufacturers Association, in order, if that were necessary, to spare software programs from the burdensome, annual tangible personal property tax.

So far as taxation in these two areas is concerned, legislatures have great power. They usually may act to achieve results such as those referred to above without running afoul of any constitutions.

What we desperately need is a sophisticated approach to the computer industry and its technology so the tasks of including or exempting properties and transactions from taxation are performed intelligently.

Roy N. Freed

Boston, Mass.

Questions Surround Enforcement

The article titled "DP Groups' Codes of Ethics Abundant But Unenforced" was successful in describing the groups' codes of ethics, but failed to detail examples of unenforcement.

I personally agree with the point of the article — that many DP codes of ethics exist, but go unenforced. I like the principles of the codes, but not if they become another superficial document. One or more persons have to take the responsibility to differentiate good from bad in DP.

The questions are: Who will enforce? What will be enforced? How will this be done?

Cindy L. Ceschi

Milwaukee, Wis.

Data Past

Five Years Ago
May 24, 1972

ATLANTIC CITY, N.J. — The close of the Spring Joint Computer Conference here marked the end of an era. Exhibiting companies decreased from 300 to 144 and large mainframe makers stopped exhibiting. In reaction to this trend, the American Federation of Information Processing Societies decided future Joint Computer Conferencs would be held in larger population centers.

— — —

ATLANTIC CITY, N.J. — IBM embarked on a $40 million, five-year project to develop data security options and to make the options available to large users.

Eight Years Ago
May 28, 1969

BOSTON — The Spring Joint Computer Conference opened here, in a town that apparently was not ready for it. A company president whose hotel reservationwasn't honored because of overcrowding wandered around a hotel in the middle of the night until someone finally offered him a couch to sleep on.

— — —

BOSTON — During its meeting at the Spring Joint Computer Conference, the Council of the Association for Computing Machinery canceled its professional development program and cut eight people from the headquarters staff because of a worsening financial crisis.

Small Systems People – Part 3

Mini Mart Spawns Brave New World of Consultants

By Jack Stone
Special to Computerworld

As the minisystems market careens wildly along in its booming growth (its maturation phase being light years away), vendors and customers are discovering new ways of doing business, new directions for systems development and new styles of communication. When a component force in the marketplace ebbs or flows, other forces rise and fall in sympathetic response.

In this column, we examine the viewpoint of the minicomputer systems consultant, an emerging DP professional whose primary business goals are to bring the unpolished customized system of the independent mini software vendor up to the level of a bright and shiny "standard" product and then handle the marketing job.

Application software in the business systems mini market today turns out to be typically only 60% to 80% of what is actually needed for the small business user.

As a result, the neophyte mini software vendor is running himself ragged, trying to trim, cut and paste the programs after installation in order to win his certificate of distinction — the letter of customer acceptance — and his badge of glory — the customer check in full.

Clearly, the greater the degree of standardization, the higher the potential profitability of the product — with the proviso that the small business systems buyer will buy the standard product.

It turns out that one of the market forces that the systems vendors must reckon with is the fierce and rugged individualism of the typical small business account, be it that of the doctor, lawyer or Indian chief.

It takes a great deal of sales, marketing, contracting and human relations skills to negotiate a contract with this class of customer who has a unique set of business circumstances (I'll accept this premise) and insists that a "standard" product be totally overhauled to meet these unique needs (although this has to be negotiated and in a proper manner for the small software vendor to stay in business).

Voila! Enter the minisystems consultant.

Joe. Larimore is the owner of Joseph W. Larimore Associates, a St. Louis firm that performs the systems consultant role in the small business systems industry.

One of his software vendor accounts is Viacomp Systems, which uses a Wang computer and proprietary software called Rapid to provide a management system for radio and TV broadcast stations [CW, May 9 and 16].

Joe also markets his own software product, Star Trac, an automated dispatching, information retrieval and statistical analysis system for police operations in the smaller cities. This product was also designed for Wang computing equipment.

Here is Joe's story.

I've been in the DP business for about 16 years now, I guess. Like many of us in minisystems today, I have a background in the design and implementation of large-scale, terminal-oriented data base systems and extensive experience in police management systems.

I started my own business about seven years ago to take advantage both of my technical background and my business and marketing expertise. Although we're still small, we have had quite a number of successful installations of the various products we handle, and I feel the small business market is about ready to undergo a major expansion.

The Human Connection

But to address this market, watch out! It can lead quickly to disaster for the unsuspecting independent vendors.

We religiously adhere to five basic assumptions about a new small business account.

First, the user has only a vague idea of what is needed for the business. Specific products are not defined.

This situation develops from many different circumstances: a lack of knowledge about capabilities and limitations of DP; lack of time studying the problem; or lack of understanding about the user's own business.

We, as systems consultants, must help the user generate a very specific set of system specifications.

Second, the user has a gross misconception about the purpose and role of computing systems in the user's organization. We must start the training process from the start of our first marketing call.

Third, there is no DP competence currently onboard and none planned for any time in the future.

Fourth, in spite of the foregoing, the user will insist that the system meet his need exactly, so we have to be ready to negotiate changes in his organization and procedure vs. changes in our product.

Finally, if the minicomputer hardware salesman was ahead of us, we can expect that the account is "undersold" in that the user underestimates the amount of equipment necessary to do his job.

It doesn't take much imagination to visualize some of the tasks that the systems consultant must accomplish.

Many software vendors who have already bit the dust learned too late about the fundamental precepts of this business. Let's look at the typical distribution of software costs for a new product.

We expect that 10% would be directly supportive of the sales effort, 50% for training, follow-on maintenance and support and only 40% for software development.

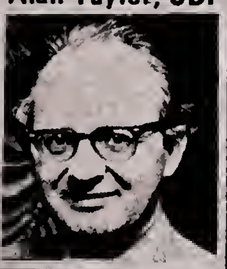
Although many aspects of this business can drive you crazy, there are also great moments of personal pride and achievement. They occur every time the customer sends his final payment.

Hybrid DP Performance Measurements Need Revamp

Probably the most interesting 1977 product I have noticed has been the replacement of some minicomputer disks and drums by compatible memories. This was introduced by Ampex in January under the name of Megastore. As the vendor said at the time, the replacement of the drum/disk devices by some form of core, bubble or wire storage has been expected for many years. The IBM Management Committee some five or six years ago anticipated it occurring in 1979 — so the timing seemed right.

The Taylor Report

By
Alan Taylor, CDP



Despite the prior talk about the situation, in some ways the product introduction went very like the introduction back in 1964 of the IBM "extended memory." At that time, while the performance statistics of the extended memory (a slow 8-microsec extension to main memory) were staggering compared with those of the disks it could to some extent replace, the product still failed to find a place in the hearts of users.

Software Transparency

Ampex has faced up to one of the major stumbling blocks that slowed the IBM effort (and a somewhat equivalent one by Control Data Corp. on its 6800 during the same period). Ampex provided for software transparency, even implementing unnecessary registers such as the data buffer and drive-type ones on the version addressed to the Digital Equipment Corp. PDP-11 replacement computers, for instance.

Software transparency is obviously very important during conversions, simplifying them out of recognition. No one likes even the slightest set of "minor" changes that are so often considered necessary in order to get some promised improvement. The risks involved in such modifications, as well as the pure manpower and testing involved, have always militated against the adoption of any advance that requires changing all the programs in sight.

Ampex has avoided this by doing the extra work to allow "plug-to-plug" interchange where specific existing products are replaced.

But there are problems in this approach when the conversion phase is over. How much overhead is really occurring in satisfying the imaginary requirements of the replaced unit? No one currently seems to know. Alan Theesfeld, an early user of the Data General replacement, seems to think that nearly half of the advantage was lost without the use of modified software.

While such an estimate appears high, it may not be. Ampex argues that the method of comparing its product with its predecessors is to evaluate the block access and transfer times (Blatt) of the various possibilities. A Blatt is the time required to access and transfer one complete 256-word (512-byte) block, in the case of Nova replacement. How Blatts are worked out for other systems is shown in the figure below.

On this basis, the performance of the Megastore is nearly six times better than the best available replacement — while the cost is only just over twice the amount.

But there is a disturbing inconsistency in the Blatt equation. Ampex never claimed that any such 80% performance improvement will in fact be obtained — or even has been obtained. Ampex's performance figures indicate 30% — not 80% — improvement, which would be indicated by the Blatt figures.

In fact, a whole new set of considerations is required in the evaluation of replacement systems like these electronic disks. It just isn't sufficient to work on some form of a simplified price/performance analysis, saying that, for instance "Megastore provides a 5.8 increase in speed over fixed-head disk at only a 2.17 increase in cost. This increase in speed has resulted in a 20% to 30% increase in throughput in a Nova-based system."

At its earliest stage, the analysis must break out apples from oranges. Throughput, for instance, applies to the whole system, while the cost comparison applies only to the cost of the disks themselves. Mixing these figures up would be a major mistake.

Then there is the whole question of the access time in the calculations. Whether for fixed- or moving-head devices, access time is a variable, not a fixed number. The 8.4 msec access time shown in the figure is only an average time — and averages simply don't reflect performance improvements correctly.

To estimate what the performance increase is going to be is very hard, so hard that a better way of approaching the problem appears to be to reverse the approach. We may not know what the performance part of the price/performance equation is — but we do know what the price is. Given that, we can then work out what improvement in performance is needed in order to justify an expenditure.

It may be, for instance, that the price difference is $10,000. Then the question is whether a 5%, 10%, 15% or whatever improvement in throughput would justify an expenditure of $10,000.

The next step is to see whether such a performance increase is being obtained in practice — by experiment rather than calculations.

Morover, it seems to me that such a "try it before you buy it" approach is the wave of the future as far as selling plug-compatible equipment is concerned.

Practical results with the specific programs seems to be the only way of operation, at any rate in the new plug-compatible hardware/software hybrid world.

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PERFORMANCE COMPARISON

Device	Access time	Transfer rate (microsecond/word)	BLATT *
Cartridge (moving head)	87.5 millisecond	11.1	90.34 millisecond
Fixed head	8.4 millisecond	8.0	10.45 millisecond
Megastore 1223	2.5 microsecond	7.0	1.80 millisecond

* BLATT is the time required to access and transfer one complete 256 word block of data (the block size for data in Nova computers). This time is truly the only figure of merit for peripheral performance, since it represents the time required to transfer data into the CPU before system operations can continue.

The above calculation method, which purports to show the performance comparison of an electronic replacement for disks, seems to raise more questions than it answers.

Action by States Recommended

Call for Licensing of DPers Shows Issue Still Alive

By Kenniston W. Lord

Special to Computerworld

"It is clear that there is a substantial and tangible public need for the licensing of computer professionals and other data processors whose work affects the public health, safety and well-being.

"Despite the data processing industry's fears about state licensing, the public's interest must outweigh industry hesitations. State licensing of data processors will help this growing industry, not harm it."

The above are the first two paragraphs of the "Conclusion" section of an article slated for publication in this month's *Notre Dame Journal of Legislation.* In the article, "Computer Professionals: The Need For State Licensing," the author, James E. O'Connor, proposes the designation of the Licensed Public Data Processor (LPDP) for "all computer professionals and data processors who direct, plan, supervise or work on a computer system which affects the public in a 'critical capacity.' "

The article is the culmination of two years of work by O'Connor which results in the recommendation that state legislatures actively consider the licensing of DP personnel as a necessary and desirable activity where "the control is mandated by the public need."

The paper characterizes inventory control systems, library maintenance systems and financial projection systems as not requiring such controls. Systems which require specific control, according to O'Connor, are criminal justice systems, air traffic control systems, hospital information systems, computerized transportation systems and, to a lesser degree, consumer and credit-oriented systems.

The article deals with the Society of Certified Data Processors' (SCDP) proposal of 1974, outlining its contents and assessments of why it failed, characterizing "self-interest" as "the controlling impetus behind this opposition."

. . . And in This Corner

It goes on to state that the public generally views the DPer and the DP industry "with respect" and that "the decision by occupational groups to propose or oppose licensing has always been the result of a balancing between the benefits, respect and control of entry vs. the supposed detriments of governmental intrusion. In the case of the data processing field, the scales are still tipped against such action."

O'Connor describes the attempt at the Certificate in Data Processing (CDP) program as a failure, stating that "programmers or other data processors tend to be social and professional mavericks . . . the CDP designation is not held in respect by the computer industry and therefore does not impart prestige within the industry . . . the CDP has no basis in the decision making process which surrounds employment."

In proposing a state-based statute for DPers who are working in a "critical capacity," the author suggests that it is in the purview of each legislature to provide a definition of those terms, "as the particular public need varies from state to state."

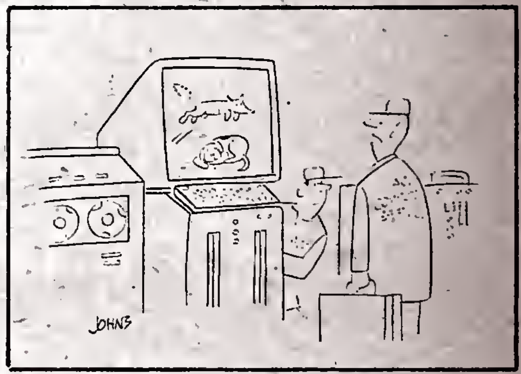
It is interesting to note, however, that should such an approach be adopted, there may well be interstate definitions to be approached, and thus the uniform code approach envisioned by the authors of the original SCDP bill may realistically emerge.

According to O'Connor, "the purpose of a state's licensing function is to protect the public, not to protect the industry."

O'Connor's article concludes: "Our technologically based society can either degenerate into a dehumanizing idolatry of electronic gadgetry, or it can develop into a computer-catalyzed Elysian-type environment, enabling man to pursue more creative, more humanistic activities.

"Data processors have the power to influence the direction of this revolution, and society must ensure the responsible exercise of this power."

Reprints of O'Connor's article are available for $2 each from Journal of Legislation, Notre Dame Law School, Notre Dame, Ind. 46556.



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Transit Group Keeps Moving

Dollars and Sense Approach Leads to Package Picks

By Don Leavitt
Of the CW Staff

WASHINGTON, D.C. — A data center can use software packages in many ways, but they will serve it best if carefully chosen so they work with and do not disrupt the center's finances or its operating procedures.

That clearly is the approach used by the Washington Metropolitan Area Transit Authority (WMATA) and its DP director, John Griffin, who is a realist.

Discussing the acquisition and use of a wide range of packages from various sources, Griffin constantly reminded himself and his listener of the need for common sense with phrases such as "I've got to look at the cost," "It's the bottom line that counts," and "We didn't opt for that; we have our own standards here."

The WMATA center provides support for project control over the building of Washington's 100-mile subway system, scheduled to be completed in 1982; for planning and running of the bus systems acquired about four years ago; and for the administration of the authority itself.

In the center, WMATA has a 512K IBM 360/50 along with a 256K 360/40 and a 360/30 the same size as the 40. There are 81 people on the staff including 22 in the programming and systems group, he said.

Operating Environment

For about a year, Edos from The Computer Software Co. has provided the operating environment for all the equipment.

But use of several packages from Management and Computer Services, Inc. (Macs) goes back two years and the choice of Metacobol and Autoflow II from Applied Data Research, Inc. (ADR) goes back to 1972, Griffin recalled.

The move to Edos came about when the center's workload seemed ready to overwhelm the DOS/Power combination then in place. Griffin knew he wanted a new environment, but didn't want to go to OS.

He chose Edos, including its six-partition support, even though the center is only using four of them now. The tape drives are shared by the 30 and the 40, but WMATA isn't using the Edos/Gemini software to manage that operation. Griffin said he felt use of a 3805 controller was more effective.

Some of the center's choices seem odd until they are examined closely. ADR's Metacobol, for example, has a test data generator as an option, but Griffin decided to go with Macs' Datamacs instead "primarily because of the cost," he said.

Responsive to Needs

The less expensive package doesn't have all the niceties of the Metacobol option or all the things that Griffin might like to have, but "it does exactly what I expected it to do and it is responsive to my needs," he stated. And that meets his test for value.

Pulmacs is Macs' program library update system and Griffin had his problems with this product as it developed, but he's happy now.

He said Pulmacs I was "all right," but Pulmacs II was a "disaster." The company hurriedly put out Pulmacs III and that has turned out to be better than the original package, he added.

In any case, Griffin tested it against competitive packages and decided he couldn't go wrong with Pulmacs, considering its price.

Infomacs is still another Macs' package the center uses, recognizing its limitations. Described as a file stripper and report generator, it has no facilities for handling logical relationships, but it is good for quick-and-dirty one-time reports based on extraction of data that is in place on a file, Griffin explained.

He said he sent Macs a list of 11 recommendations on how the product could be improved and has hopes the vendor will go to work on most of them.

Griffin has been implementing parts of a new package Macs has called Systemacs, but WMATA is using the methodology the package supports rather than many of its programmed parts.

He strongly encourages his programmers to work with ADR's Autoflow II and its Automatic System Flowcharter.

The "encouragement" takes the form of a rule that a programmer must put his program through Autoflow II if he fails to get a clean compile after three tries.

The Autoflow output and the program source code are then reviewed by the programmer and his supervisor to find the problem, Griffin said.

'Inquire' Includes Field-Level Security

FALLS CHURCH, Va. — Release 9 Version 1 of the Inquire data base management system includes dynamic allocation of tables used in many of the basic commands, field-level security and support for substitution of macros parameters, according to the vendor, Infodata Systems, Inc.

Dynamic table allocation (DTA) causes selected tables to grow or shrink as needed to compile a query or maintenance command. Most tables are included, the spokesman noted, although there are some exceptions.

In use, this facility means that once the input and macro tables are allocated, the user does not have to be concerned with other tables. They change in size as they are used and a query will fail for lack of space only if there is no space available in the table area after DTA, the spokesman added.

Field-level security permits a field to be protected by assigning it to one of eight classes for reading and one of another group of eight classes for updating.

Field classes may be originally assigned when a data base is created or changed by a new utility after the data base is established. The security exit will be improved so that most code and all tables may be generated by macros without the need of any assembler coding, Infodata said.

Field security will also be available in the Procedural Language Interface that allows programs in Cobol, PL/I, Fortran or Assembler to access or update Inquire data bases in a full multithread environment, the spokesman added.

Inquire can be used in IBM 360/370 centers under OS or OS/VS, with TSO, CICS, IMS/DC or other teleprocessing monitors.

The Infodata package uses about 150K of memory and costs from $15,500 to $78,500, depending on options selected.

The Infodata is at 5205 Leesburg Pike, Falls Church, Va. 22041.

ASI Video Updates More Frequent Now

ELK GROVE VILLAGE, Ill. — Advanced Systems, Inc. (ASI) has increased the production of its Computer Technology Video Updates from once quarterly to once a month.

The video updates feature news-format interviews of experts on state-of-the-art developments in a wide variety of DP activities, ASI explained.

The tapes are supplemented by color graphics and a short text, detailing some of the points made in the video session, a spokesman added.

Topics covered in the video updates released since September include computer security, the pros and cons of IBM's Virtual Machine facility (VM/370) and a five-year forecast for information processing aimed chiefly at non-DP managers, he said.

ASI is at 1601 Tonne Road, Elk Grove Village, Ill. 60007.

CPA Code Uses Datasystem 310

LOS ANGELES — A comprehensive financial reporting system from Franklen Computer Systems, Inc. is said to provide users of the Digital Equipment Corp. Datasystem 310 the means to produce departmental activity reporting from a general ledger system.

Intended for use in a certified public acountant's office for client write-ups, the system can be smoothly interfaced with any existing general accounting programs, the vendor claimed.

Working with a single-entry format, the package can support 99 corporate entities, each with 99 locations and flexible charts of accounts, the vendor added.

The system features fixed or variable budgeting, prior year comparisons, source and use of funds and cash flow statements.

In addition, per unit calculations and comparisons, cost of goods sold and provisions for tax calculations, depreciation schedules and preparation of financial statements including footnotes, are also part of the system.

An additional module provides accountant's with after-the-fact entry of payroll information for preparation of their clients' W-2 and 941 federal reporting forms, the company said.

Written in Dibol, the financial reporting package costs $3,500. Dealer plans are also available, Franklen said from 1545 Wilshire Blvd., Suite 204, Los Angeles, Calif. 90017.

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Productivity Meet Planned

ARLINGTON, Va. — The two and a half day Conference on Computer Systems Productivity, scheduled for June 27-29 here, will address the growing concern of managers and computer professionals with improving the efficiency of DP operations, according to program chairman Robert V. Head of the U.S. Department of Agriculture.

Sponsored by the Capitol Area Chapter of the Society for Management Information Systems (SMIS) and *Government Executive* magazine, the meeting is open to all interested people.

The conference will focus, successively, on five broad subject areas: trends in technology; software; performance measurement; management; and planning and productivity.

Clarence W. Spangle, president of Honeywell Information Systems, Inc., will address the first luncheon on "Managing Tomorrow's Systems" and Dr. Herbert R.J. Grosch, president of the Association for Computing Machinery, will cover "Professionalism and Productivity" at the Tuesday midday meal.

Earlier that day, Rep. Charles Rose, chairman of the policy group on information and computers of the U.S. House of Representatives, will tell the conference what Congress expects from computers. Wednesday morning will feature Joseph P. Welch, deputy assistant secretary of defense for management systems, who will speak on the computer as a resource for management.

Registration fee for the conference is $265 for SMIS members and $295 for nonmembers.

The conference will be at Twin Bridges Marriott Motor Hotel and is being managed by the Institute for Professional Education, Suite 601, 1901 North Fort Myer Drive, Arlington, Va. 22209.

Version III of Dynamo Language Installed on First Data's Net

WALTHAM, Mass. — Described as a continuous simulation language which has been used extensively in the modeling of industrial, social, economic and engineering systems, the Dynamo modeling language is now available on the First Data Corp. remote computing network.

Developed largely from work done by Jay W. Forrester at MIT, Dynamo is said to permit the application of the "systems dynamics" approach to modeling. This provides a means for decision makers to better understand their environments through identification of key variables and alternative operating procedures, First Data said.

The language used with Dynamo was designed for the person who is problem-oriented rather than DP-oriented. It provides the algebraic expression and the time integral for constructing models, the network said.

First Data is offering Dynamo Version III, the latest release of the language. It supports simplified model initialization, two types of function facilities and "easily specified" model output including plotted results, a spokesman stated.

The Dynamo model is not absolutely dependent on data; it can be completed with the available information and the sensitivity of the various parameters determined. Once these sensitivities are known, the spokesman added, intelligent priorities on data gathering can be made.

First Data Corp. is at 40 Second Ave., Waltham, Mass. 02154.

Calldata Subscribers Get Choice of CPUs

WOODBURY, N.Y. — Subscribers to the Calldata Systems, Inc. remote computing network can now access a Control Data Corp. Cyber 73 and an IBM 370/168 system through a single terminal located in the user's office or at a Calldata center, the company said recently.

A communications processing link connecting the two mainframes was established, according to Calldata, by extensively modifying the CDC-developed software package called Tieline, installing it on the Cyber 73 and connecting it by a high-speed line to the IBM 370.

Work for the two machines can be interspersed in a user's jobstream with the desired routing indicated through control cards.

At this time the Tieline benefits apply mostly to users who run batch jobs, a network spokesman said, but any user with a time-sharing terminal connected to Calldata's IBM-based time-sharing system will be able to submit CDC-executable jobs and have them execute on the Cyber 73.

Calldata, operating largely in the eastern U.S., is based at 20 Crossways Park North, Woodbury, N.Y. 11797.

BCS Training Division Offering Courses in D.C.

McLEAN, Va. — A variety of topics — job control language, Cobol optimization, Cobol debugging and data base concepts — will be covered in courses conducted this summer by the Education and Training Division of Boeing Computer Services, Inc. (BCS).

Classes will be held at the BCS training center here in McLean, but are open only to representatives of firms or organizations doing business with BCS, a spokeswoman noted.

The job control language course is scheduled for June 14-17 and costs $400. Cobol optimization, set to run June 28-30, costs $300 while the debugging course is planned for July 14-15 and carries a $200 registration fee. The data base concepts course, in late August, costs $400.

A discount of about 15% applies if two or more students come to a class from a single organization. More information is available from Judy Preysnar at the center, 7926 Jones Branch Drive, McLean, Va. 22101.

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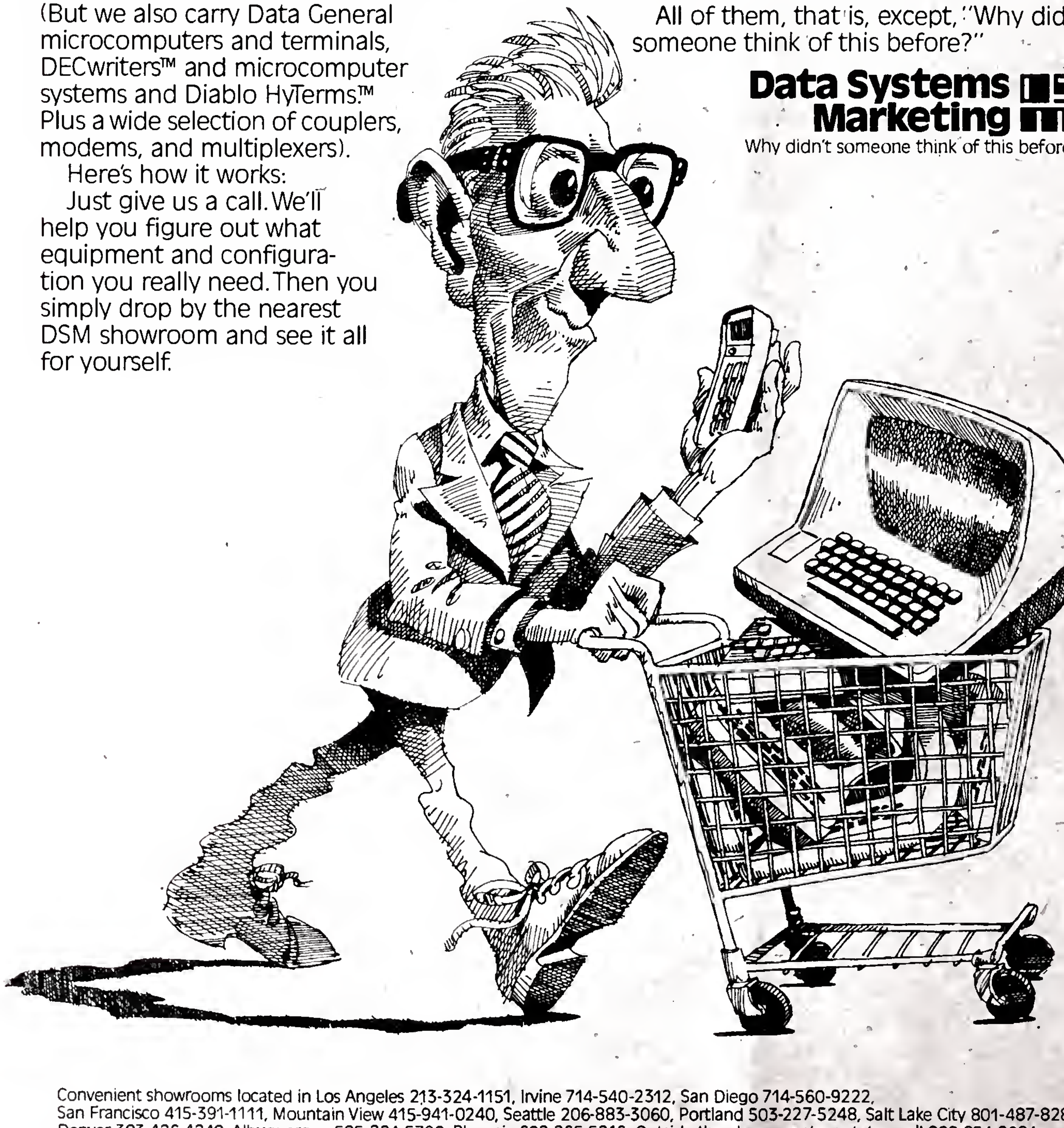

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"Every person on my staff of 35 has been trained in MARK IV. I will definitely push its use as an adjunct in our data base systems development, simply because I feel that is the right way for less qualified IMS people to deal with IMS.

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The views expressed are those of Director Dorothy J. Hopkin and not necessarily those of the University of Illinois.

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Information Flow Analysis — Part 1

Plenty of Work Seen Needed Before DBMS Selection

By Robert B. Chamberlain
Special to Computerworld

It has become an accepted truism that data base management system (DBMS) package selection cannot take place without preliminary study of some duration (the more extensive, the better) to determine the DP environment in which the selected package will be expected to perform.

The evolution of this study has generally been from a comparison of the products of different DBMS vendors (who has what type of file structure, recovery/-restart capabilities, etc.?) to organizing potential data base files and assessing their likely performance characteristics under various packages.

In the final half of this series, Chamberlain will outline some of the side effects of an information flow analysis.

A good further expansion is a service analysis of current and potential user requirements which could provide a rationale for a data base file structure differing from the existing applications-oriented files.

Two points need to be drawn from the above chronology. The first is that the steps being added, as the selection becomes more sophisticated, are all at the beginning of the process.

The second point is that service analysis, while a valuable refinement, is still not the first stage in DBMS selection, but should be preceded by a survey called the Information Flow Analysis (IFA).

Proper Beginning

The IFA is the proper and legitimate beginning of the package selection process for several good reasons, since it:

- Provides basis for file design.
- Enables the installation to document fully its current environment.
- Identifies current inconsistencies.
- Puts service analysis in the proper framework.

An exploration of IFA methodology illustrates how it provides the "good things" mentioned above, but first and foremost, the name itself — "Information Flow Analysis" — should be stressed.

The IFA's importance is in just what the name implies; it mirrors the flow of information (data, computer reports, manual forms, etc.) through the entire area of the business to be handled by the anticipated data base. For smaller firms, the entire firm can become a logical scope for the IFA.

Identification of Elements

The correct approach is to identify in their entirety all data elements contained on forms which have the potential of becoming input to an automated DP system while remembering the goal is data base design and development, not conversion of current application programs.

The identification of these elements provides the basis for a true data dictionary for the installation. It identifies those data elements which are a part of the real business being conducted (as shown by their existence on forms, reports, etc.) rather than being a listing of transitory programming created data elements such as matrix indicators, old data flags, etc.

The principle again is that the installation is willing to accept that existing programs may be significantly altered; it desires to do more than change READs to CALLs.

The IFA therefore provides the linkage between identifying elements which are used in the actual business environment and a file design procedure which organizes these elements.

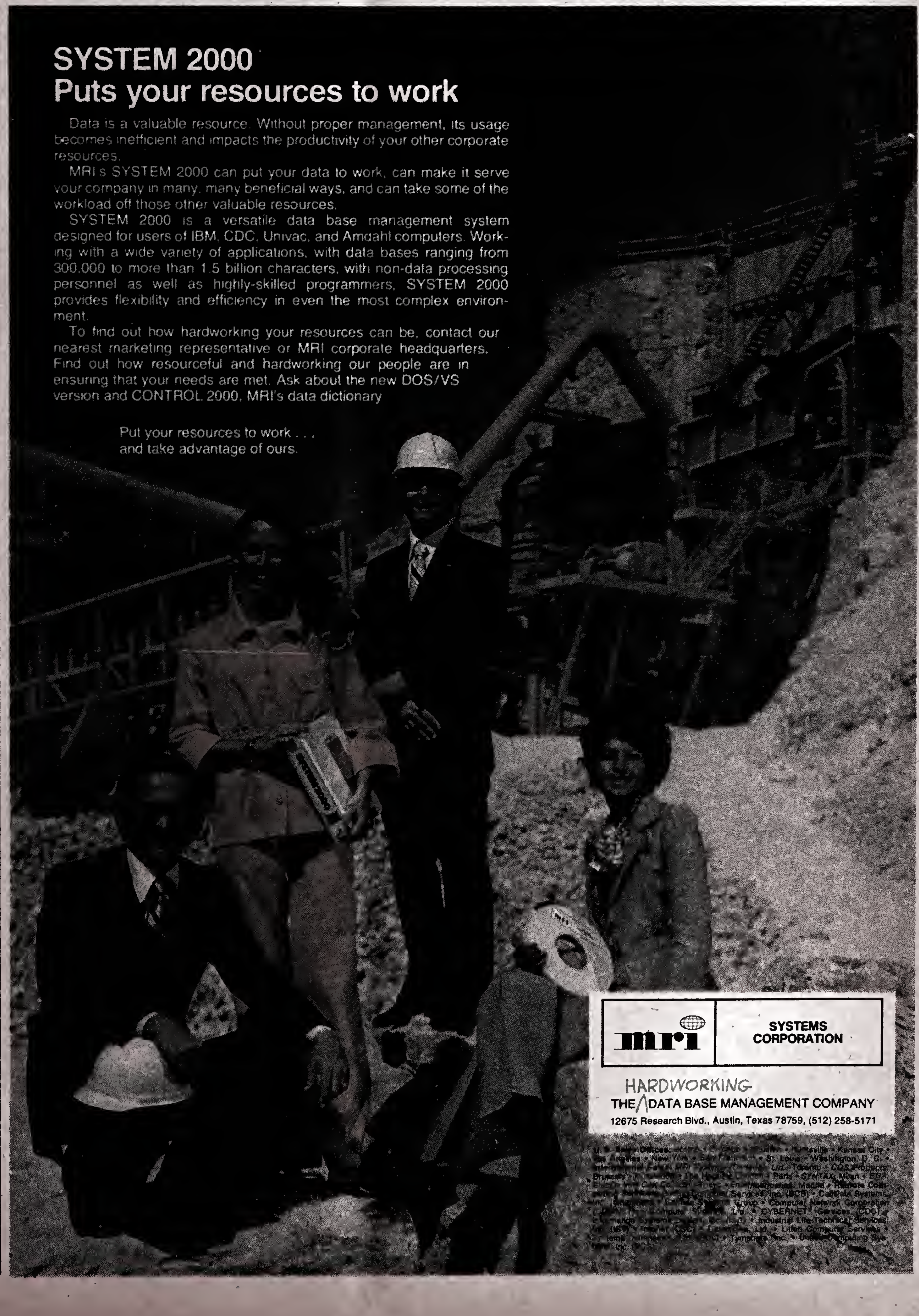
Data Basics

File design can now be based upon a direct association of elements in their primary state rather than having files evolve through a "fire-fighting" response by applications programming.

Identification of elements in their original forms is only one phase of the IFA. The occurrence of these elements as they migrate from forms to computer data to reports is also completely recorded in such a way as to reflect the chronological development and alteration of data.

Designers now will know at what point in a system a change will have impact prior to the change being made or special research being conducted for each projected change.

Chamberlain is a senior consultant in information systems with CACI, Inc. Commercial in New York.



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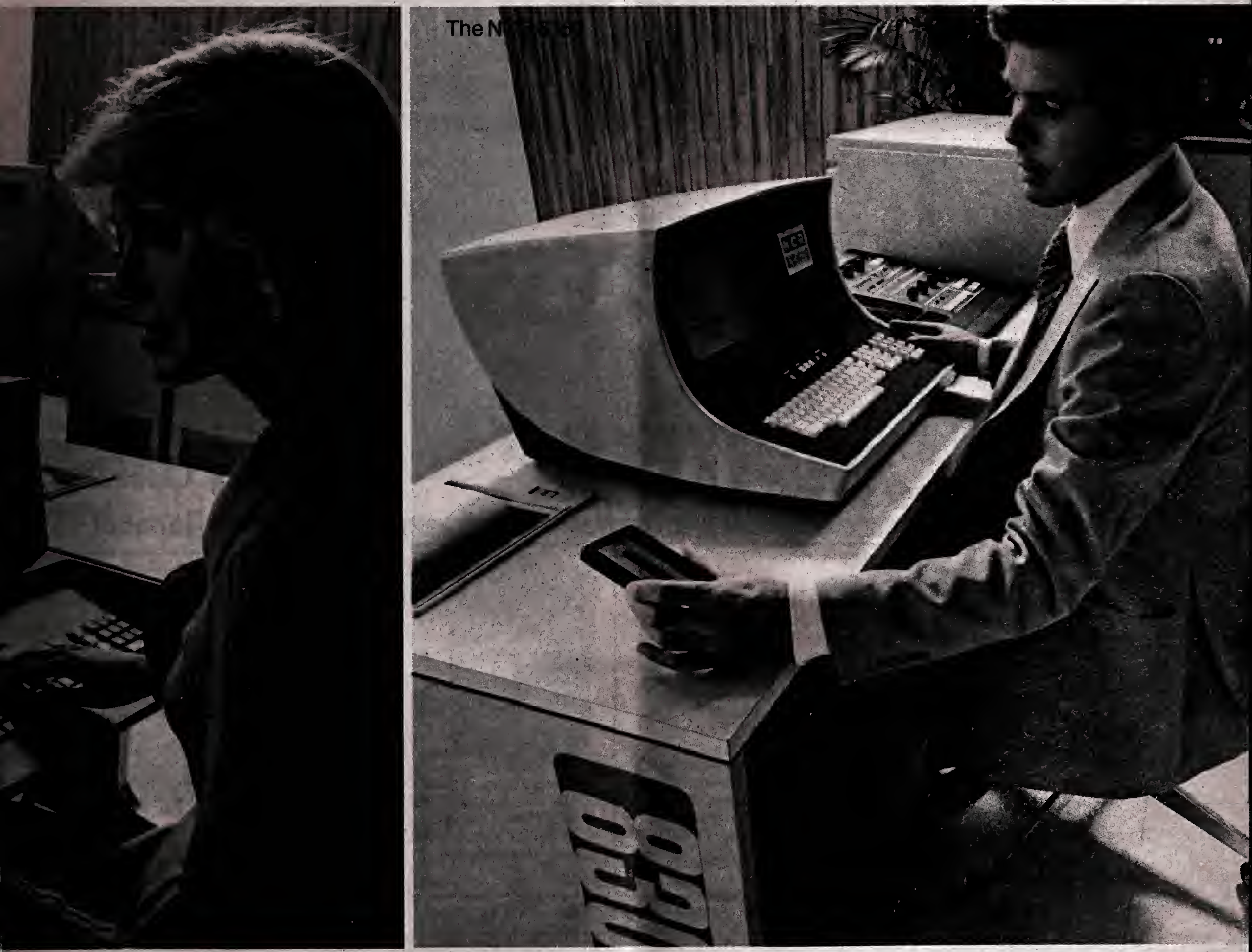

And still more computer systems to come.

CTS Succeeds in Adapting 'Ipics' to Small Systems

By Kent Milnes
Special to Computerworld

When we at CTS Corp. set software and hardware criteria for a computerized manufacturing system ["Manufacturer's Staff Adapts IBM's Ipics to S/32" CW, Oct. 4], we didn't know if the specifications could be completely met or if the system would be technically and economically successful.

Now, five different locations are in various stages of implementing the system on equipment ranging from IBM's 32 through a 3/12 to a 3/15 operating under CCP.

The technical performance of the system has exceeded all original specifications and the system's economic success is projected to go well beyond the initial return on investment forecasts.

CTS Corp. is extremely decentralized with 18 nearly autonomous, widely scattered operating facilities. In mid-1975, management recognized the economic potential of combining improved manufacturing software with lower cost hardware.

Manufacturing control was recognized as the last frontier for profits. The accounting applications which are often implemented first would be added at a later date.

Task Force

To investigate the use of decentralized small computers and to prevent duplication of effort at multiple locations, a task force was organized at the corporate level. If the project passed the feasibility stage, this task force could be commissioned to justify, develop, install and maintain the basic system at multiple CTS locations, and also to educate user groups.

With bids from many manufacturers of low-cost computers, we concluded the IBM line from the 32 through the 3 would provide the hardware capabilities required.

A 300 line/min print requirement was relaxed and a system software requirement for error exception reporting to reduce print volume was emphasized. Unattended operation would be used on long computer runs. Strong preference was given to the 32 whenever possible because of its high price/performance ratio.

The requirement for hardware maintainability coupled with the remote location of many of the CTS manufacturing plants led to the selection of IBM as a vendor. Many high-level languages were acceptable including RPG-II, the language used by the IBM product line. IBM's Initial Production and Inventory Control Software (IPIC), with four announced modules, did not cover all requirements, but appeared to be a good starting point.

Roots of Success

After nearly two years of work, we have developed a set of systems using IBM's Bill of Materials Processor (Bomp), Inventory and Requirements Planning (IRP) and Ipics as a base. The effort required to install a manufacturing system should not be considered lightly. Implementation time and overall success are complex functions of:

1. Management interest, support and involvement.
2. Education and experience of both the technical support and the user groups.
3. Previous experience of user groups in working with automated systems.
4. Disciplined procedures and accurate recordkeeping.
5. Size of the manufacturing data base to be computerized.
6. Ability of the installing location to commit and hold to an installation timetable.
7. Closeness of fit between the individual locations' requirements and the basic package.

Our most mature Ipics operation is on an IBM 32 in West Lafayette, Ind., which was installed in December 1975. This system includes engineering and production data control, inventory accounting, material requirements planning, inventory valuation and order costing. An IBM 5230 has also been installed for collection of costing information.

The most technically advanced (and expensive) system is the IBM 3/15 in Elkhart, Ind. All master files are maintained on-line under CCP with eight 3277s located throughout the plant. All maintenance transactions are security-edited on-line and backed up and repeated with batch programs which provide users with printed output the next day.

On-Line 18 Hour/Day

This on-line system runs 18 hour/day and the batch system runs unattended for five hours each night.

Our latest success is with an IBM 32 at the California installation, where the data base was transferred from a 360/30. This operation is projected to go through delivery, installation and parallel operation with the application of engineering and production data control, inventory accounting, material requirements planning and job efficiency within a period of eight weeks.

Although manufacturing applications are not easily implemented, we believe we have found a cost-effective method to develop and install these potentially highly profitable applications.

Milnes is director of corporate planning at CTS Corp. in Elkhart, Ind.

Plotting Capability Now on National CSS

NORWALK, Conn. — The Display Integrated Software System and Plotting Language (Disspla) from Integrated Software Systems Corp. of San Diego is now available on the remote computing facilities of National CSS, Inc. (NCSS), a network spokesman said.

To provide hard-copy graphic output for those users without in-house plotting equipment, Tektronix pen plotters are being installed at many NCSS branch offices, he added.

"Unlike interpretive software systems," he claimed, Disspla enables users to reap the full computational power of Fortran, Cobol and PL/I. The plotting software can be reached through Calls from any of these languages, he explained.

Disspla includes 15 standard features which can be combined as the user desires, including a range of axis systems, a broad range of alphabets and printing styles for notation and three-dimensional projections with or without hidden lines.

Other features range from pie and bar graphs to continental map coastlines with resolution to .5 and 15 different map projections or user-defined variations, he said.

Disspla can be used with "any type of plotting device," the company added from 542 Westport Ave., Norwalk, Conn. 06851.

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DP69/CW57

Missing Facts Cause Mistakes

Decision to Make or Buy Software Seen Difficult

By Nancy French
Of the CW Staff

NEW YORK — Many things have to be taken into account when an installation is considering the "make or buy" decision on application software, a consultant told a Computer Caravan audience here recently.

Among the considerations, according to Gerald P. O'Brien, must be the cost of maintenance, the risk of failure to get the application in place, the speed with which the system can be installed, the age of the code in available packages and the quality of work done by a custom programming shop if that is the route finally chosen.

One reason many users make mistakes in deciding whether to buy a package, to hire a consulting firm or to develop programming in-house is that they don't have all the facts, O'Brien said.

As a rule of thumb, users should expect to spend as much maintaining a package over a four-year period as the vendor originally spent to develop it, he warned.

Breaking down that estimate, he said maintenance is generally considered to vary from $2.18- to $7/line of code. The more complex the system, the higher the maintenance cost.

While some packages carry the least risk of failure to get a system installed, they are not "by definition" the only way to go, O'Brien said. The time needed to get the system in place may be the primary concern: business needs change, he explained, and it does no good to get a system up and running after it's no longer needed.

Users can reduce the risk of failure — the risk of a mismatch between user needs and package capabilities — by researching available packages and developing a feature matrix to assist in rating each one, he said, citing one of the classic approaches to evaluation.

Once the matrix is ready, "determine the risks inherent in each choice and estimate the internal costs." Cost estimates are usually "overoptimistic," he warned.

The key to determining the maintainability of a package is to look at the source code, he said. If the package is four or five years old and the vendor's modifications have been extensive, the source code could look like "a bowl of spaghetti" and be just as hard to handle, he said.

No one should buy a package at that stage of its life. If, on the other hand, structured programming concepts were used in its original writing, a package will have a long useful life, he added.

"A good test is to give a couple of bogus maintenance assignments to your two best maintenance programmers and see how they make out. They may become ill," he quipped.

Bugs in System

The incidence of bugs in a system is a function of age, O'Brien said, moving to a related subject. The optimum age at which a system functions as close to bug free as possible is about a year and a half after introduction, he estimated.

When a system is new, it has lots of bugs because it hasn't been tested thoroughly. The number of bugs drops gradually as modifications are made, but finally there will be enough modifications so they will create new bugs, he said.

Most changes are not subject to the same vigorous testing as the original development of the system, he noted.

Users who intend to customize a package would be advised to pass up the vendor's offer of systems maintenance because fitting the user's modifications to each new release of the package can become a sizable burden, O'Brien indicated.

If research has found that no existing applications package is just right for a company's needs and the firm lacks the in-house resources to write its own, an outside organization can be hired to develop a customized package.

If this is the choice, "spend the time needed to develop a request for proposal and solicit bids," he urged.

"Always check references provided by the software house — and don't talk only to the individual in a using firm that the consultant gives you as a reference," he added.

"Sometimes you can learn more about a consultant by talking to some of the lower echelon individuals in the user's firm that worked directly with the consultant."

It is important to draw up a formal agreement with the consultant especially if the contract is for $5,000 or more, he said. Then, be sure to test the credentials of the people with whom you are signing the contract.

If the least risk approach seems to be to develop your own application in-house, be sure you have the resources —"the right kinds of bodies" — to get the job done, he concluded.

Independent Vendor Enhances TSO Usage

MILWAUKEE — The VIP package now available from DASD Corp. is said to add three commands to an IBM Time Sharing Option (TSO) environment, providing inquiry, update and create capabilities for Bsam, Qsam, Bdam, Bisam and Qisam data sets.

In addition to the general inquiry/update system, the package enables programmers to create complex test files for debugging runs while another feature supports the creation of system flow charts on 8.5- by 11-in. paper.

VIP also has a special feature allowing random access of sequential files, a spokesman added. The package costs $7,800, the company said from 8705 N. Port Washington Road, Milwaukee, Wis. 53217.

Planning Seminars Set For Late June in N.Y.C.

NEW YORK — A two-day seminar on "How to Develop a Business System Plan" and a three-day seminar on "How to Develop a Long-Range DP Plan" will be presented here late next month.

Registration fees are $320 and $450 respectively, according to the sponsor, Brandon Systems Institute, Inc., 4720 Montgomery Lane, Bethesda, Md. 20014.

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WU Files Tariff Changes To Compete With Bell

UPPER SADDLE RIVER, N.J. — Western Union filed interim tariff revisions earlier this month with the Federal Communications Commission that will hurt some users of its services and help others.

In a move to remain competitive with Bell, WU has filed to eliminate the Series 5000 Telpak rate schedule and establish interim rates for the Series 2000 and 3000 voice-grade private-line service, matching new Bell rates, a WU spokesman said.

The interim rate schedule is scheduled to become effective on June 8, the same day the Bell rate filings with the FCC will occur, he said.

However, there will be a "thorough review of WU private-line rates and a subsequent refiling by WU in late June or early July, in accordance with the normal 90-day statutory notice requirement," the spokesman noted.

The 15 users of WU's Telpak services, which include the federal government, will experience rate increases in converting to the Multischedule Private Line services, he said.

WU's 300 commercial users of private lines, however, will receive price reductions which will vary from user to user, the spokesman added.

The net effect of the interim revisions is expected to increase the company's revenues at an annualized rate of $700,000 for voice services and $4.3 million for low-speed services.

Without Using Vtam, NCP

CTX Offers Upgrade to IBM Net

By Ronald A. Frank
Of the CW Staff

BEDFORD, Mass. — Teleprocessing users planning to upgrade networks with IBM CPUs usually have to consider IBM's Systems Network Architecture (SNA) software.

But an independent software firm here specializing in compatible software has provided users with an upgrade path that eliminates use of most IBM packages.

Cambridge Telecommunications, Inc. (CTX) provides a method of interfacing IBM host CPUs to public packet nets without switching to Virtual Telecommunications Access Method (Vtam) or the Network Control Program (NCP), according to a CTX spokesman.

Called DMEP II, the software can be installed in 370X front ends with 48K or more of storage operating under IBM's Emulation Program (EP). The DMEP package runs in conjunction with V2X/3270 which is designed for intelligent versions of the IBM 3270 terminal.

The V2X/3270 allows remote 3270-type terminals to operate with CICS, IMS, VM/CMS and TSO while having the capability to use public packet nets, the spokesman said.

With the V2X/3270 package, terminals can operate under most Btam and Tcam applications programs, the firm indicated.

Implementation of this terminal package has thus far been limited to Raytheon Co. 3270-type terminals. The package is available for this environment under the name of Raypac for $100/mo [CW, April 4].

Use of DMEP II and V2X/3270 could be adapted to other intelligent versions of the 3270, according to the spokesman. Eventually, it could also work with the IBM terminals but, up to now, this system does not have the required intelligence, he said.

The DMEP and V2X software installation allows a user to have most Vtam features with current non-Vtam software, the spokesman continued.

It allows CPU-to-CPU communications for all mainframes in a network and it enables a single terminal to share Btam-based application programs.

It also provides some of the multiple domain features announced with IBM's Advanced Communications Function (ACF), he added.

Imbedded in the DMEP and V2X packages is a public packet network host interface called PPX which provides an X.25 protocol capability and controls the status and data exchange between host application programs and the remote 3270-type terminals.

Since PPX is a component of both DMEP and V2X, its implementation is transparent to the applications programs, the spokesman said.

Advantages of using the two software packages over 3270 nets operating in binary synchronous protocol are that polling is removed from the network, the spokesman explained.

CRTs attached to one controller can communicate with multiple applications programs: Large inhouse dedicated nets can be replaced with public packet facilities requiring only local connections for both CPUs and terminals and no host software changes are required, the firm said.

CTX also has developed software to interface 360 and 370 hosts with Ascii and 2741-type terminals to public packet nets. And software is now being developed to extend these capabilities to 2780-type terminals.

DMEP II for the Raytheon implementation costs $750/mo for licensing and maintenance. CTX is at 41 North Road, Bedford, Mass. 01730.

TSP Now Mandatory For Federal Services

WASHINGTON, D.C. — The U.S. General Services Administration (GSA) recently announced its Teleprocessing Services Program (TSP) will be the mandatory means for federal agencies to acquire commercial teleprocessing services beginning Aug. 1.

TSP is a method for federal agencies to acquire interactive and remote-batch DP services from the private sector, according to the GSA [CW, May 16].

GSA said it has basic agreements with more than 80 firms and has awarded eight TSP schedule contracts to date; many more are expected in the next few months.

The agency said it is accelerating its negotiations with firms which have not yet received schedule contracts awards.

GSA's Automated Data and Telecommunications Service is located in Washington, D.C. 20405.

Communications Technology Advances Seen Forcing Question of Integration

By Ann Dooley
Of the CW Staff

NEW YORK — There has been a tremendous improvement in communication devices in the 1970s, according to Dr. Howard Frank, president of Network Analysis Corp.

"Previously, we had on/off devices and now we have data sets which can transmit at speeds from a few bits per second to a million bit/sec," Frank told a Computer Caravan audience recently.

New devices to reduce costs have been developed along with minis and switching networks, he said. There are bigger and better CPU memory and peripherals as well as advances in software technology and interactive programming.

Now the question is to decide how to put them all together, Frank said.

In that decision, cost should and, out of necessity, will be a major factor, Frank told his audience.

Technology is driving down the cost of equipment. By 1985 there will be a marked shift in the bill between DP and communications, he said.

Budget Forecast

Today, hardware makes up 40% of the total budget and communication services make up 9%. By 1985, 10% of the budget will go to terminals and 80% will go toward communication, Frank forecast.

In addition, people costs are going up and hardware costs are going down. Communication costs are going down slowly, but the need for communication is increasing, Frank said.

"Users and planners must reorient their thinking," Frank warned. Since the dominant costs will be in communications and people, newly developed systems must work around these factors, he said.

Currently, there are three kinds of network architecture: centralized, distributed and hierarchical. In deciding which to use, personnel and communications must be minimized in order for the system to be cost effective, Frank said.

With decreasing hardware costs, "the decision should be made entirely exclusive of that consideration," he said.

Line Cost Increases

Communication hardware is getting less expensive, but the line costs continue to increase. Local access makes up 50% to 60% of the total communication bill, he continued.

Long-haul communication lines have been made cheaper as a result of advances in technology, he noted.

"Data is increasing faster than ever, but for the next few years, voice communications will dominate," he said.

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Also Achieves Faster Turnaround

T/S Services User Converts to RJE to Save $3,500/Mo

By Ann Dooley
Of the CW Staff

MINNEAPOLIS — A multinational user of 3M Co.'s time-sharing services plans to save $3,500 each month by changing over to a remote job entry (RJE) system to achieve faster turnaround and better service.

Robert D. Peterson, remote-service analyst for 3M Co. recently described to Computer Caravan attendees the unidentified user's problems in converting to an RJE system from its semiautomated reporting system.

The 3M data communications system includes IBM 3705-II communications controllers, Data 100 Corp. Model 78 and Sycor, Inc. Model 351s linked to two 4M-byte IBM 370/168s.

Additional terminals 3M uses to provide its time-sharing services come from Datapoint Corp., Harris Corp. and Wang Laboratories, Inc., Peterson said.

A Univac 418 switching computer is also used because IBM equipment can't interface with 3M's additional NCR Corp. terminals.

The user will soon make a move to IBM Virtual Telecommunications Access Method (Vtam), while keeping its IBM Job Entry System (JES) 2, Peterson said. The RJE application should then be transmitted in IBM Binary Synchronous Communications (BSC) under Synchronous Data Link Control (SDLC), he added.

High Time-Sharing Costs

The case study which Peterson presented to his audience involved the user company's plants transmitting information to the time-sharing vendor which would relay it to a terminal for processing reports. The data would then be transmitted to one of the 370 mainframes, Peterson said.

The problems with the user's system, according to Peterson, were because the time-sharing costs were $7,000/mo (which he indicated were very high) and that timely reports were needed by the user.

With its old system, the user would receive some manual reports and some automated data from several sources which considerably slowed the information processing, Peterson said.

Under an RJE system, the user still has its international plants feeding in to the time-sharing vendor, but the RJE terminals will interface with the data base and then the CPUs. In addition, the manual reports are now keypunched, he noted.

The problem the user encountered was that it had to rewrite its programs in Cobol to conform with 3M's time-sharing and data communications system, he said.

Steps to Ease Transition

In switching a user to RJE communications, 3M goes through certain procedures to ease the transition for its customer, Peterson said.

The first stage in the conversion process is performing a remote location analysis, Peterson said.

"The most important thing is to develop a good working relationship with the customer," he told his audience. "We must understand the users' business."

Then the data communications requirements needed must be discovered. These include who will be involved, where they're located, how much the system will be used and when its peak load hours will be, he explained.

The second stage is planning, Peterson said. "We find out what terminals are needed. Then, in order to link with our system, we need to emulate an IBM 2780 punch device.

"Also we have to emulate an [IBM] Hasp workstation which includes multileaving so that data can be sent in both directions at once and emulate multiprint outputs and multipunch outputs."

Further Determinations

The storage medium to be used, either tape or disk, also has to be decided, he said. The system also includes a card reader, printer and, in the future, IBM Systems Network Architecture (SNA) and SDLC lines. Which lines and modems are to be used and if enough are available for the particular company's use must also be determined, Peterson said.

The minicomputer selected for this company's needs was a Data 100 Model 78 which "could handle everything that was wanted," Peterson said, adding it has the best Hasp workstation, it can dynamically allocate resources and has off-line capabilities.

Implementation and Planning

The third stage of 3M's effort is implementation, according to Peterson.

This means ordering the equipment — including the terminal, modems and lines, keypunches and any other necessary equipment, Peterson said.

User-site preparations must be examined, he noted. The necessary amount of space must be allocated and electrical capacity and air conditioning must be present, Peterson said.

The next stage is to plan and schedule the 370 system generation, which includes MVS and JES 2, Peterson said.

Another part of the conversion program is to educate the new user to MVS, JCL, Cobol and other packages, Peterson said. "They don't realize what a simple life they lived until we get hold of them."

The last stage in the conversion includes providing RJE conventions and manuals which define most of the stages and changes, Peterson said.

"One of the biggest problems is the human element — just being available to answer questions," Peterson said. "We have a master terminal analyst who handles most of the problems and those he can't help, he refers to other people within the 3M system, he said.

Correction

General Datacomm Industries, Inc.'s recent product registrations with the Federal Communications Commission include modems and data couplers, not acoustic couplers [CW, May 9]; the modem models do not include the 202C and 202CR, but rather the 201C and 201CR as well as the 202 ST.

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GDC Control System Extends Testing To Multipoint and Multiline Networks

WILTON, Conn. — The Netcon-2 diagnostic control system from General Datacomm Industries, Inc. (GDC) reportedly extends test, control and diagnostic functions from the central DP site to remote terminals.

Netcon-2 is a modular system which "overlays" modems in multipoint and multiline networks as well as Bell Dataphone Digital Service (DDS) nets and other digital transmission links, according to a GDC spokesman.

Remote network testing is accomplished by the control system within the data path, which is said to eliminate the equipment associated with secondary transmission channels.

The system can address up to 32 remote stations on a multipoint line; the number of multipoint lines handled is unlimited, the spokesman said.

Two Modules

Two modules comprise the Netcon-2 system; the NDC-20 network diagnostic controller and one of four multipoint diagnostic receivers. Diagnostic commands and remote site addresses are switch-selectable on the $895 NDC-20 controller by central site personnel.

A proprietary control technique ensures data is not interpreted as diagnostic commands, GDC said.

If GDC 1,200- or 2,400 bit/sec modems are used in the multipoint network, they must utilize a synchronous or asynchronous remote control plug-in card to receive, decode and execute the diagnostic commands, the spokesman said. The card costs $165.

Other GDC modems and those of other vendors with RS-232C compatibility which operate at speeds up to 9,600 bit/sec must be used with GDC MDR-21 or MDR-22 multipoint diagnostic receivers to execute the diagnostic commands, he noted.

In a Bell DDS network, MDR-23 or MDR-24 receivers execute the Netcon-2 commands at the interface between the DDS Digital Service Unit (DSU) and a terminal. The MDR-23 and MDR-24 models provide automatic dial backup at any remote modem or DSU, respectively, the spokesman added.

The MDRs cost $325 to $425 each and work on a one-to-one basis with the modems or DSUs.

A typical Netcon-2 configuration serving a 10-line network with 12 terminals on each line costs about $3,150, the spokesman stated from GDC at 131 Danbury Road, Wilton, Conn. 06897.

Data Set Works With WUIS 4000

MAHWAH, N.J. — The Model 4196 data set from Western Union Information Systems (WUIS) is a 9,600 bit/sec LSI modem designed for use with the firm's Series 4000 family of network processors.

Aimed at distributed and hierarchical networks, the 4196 permits switch-selectable transmission at 4,800-, 7,200- or 9,600 bit/sec or through terminals connected to an RS-232C interface cable, the company said.

The modem operates in full-duplex, synchronous mode in bit serial form over a voice-grade, Bell 3002-type channel.

The design of the modem provides operation withstanding up to 2 sec of transient line impairments without having to retrain, the company said, adding digital filters eliminate analog drift.

Features include LED status indicators for monitoring equipment and line operations. Control switches and status indicators also permit selection of various test modes, according to WUIS.

Options include a voice adapter to provide alternate voice capability on leased-line circuits; a line switch for switchover between two sets of four-wire lines; and two-call direct-dial backup.

The price of the 4196 data set is $6,500, WUIS said from 82 McKee Drive, Mahwah, N.J. 07430.

WUIS Starts Upkeep Service

MAHWAH, N.J. — Western Union Information Systems (WUIS) has established a nationwide customer maintenance service and field engineering support for all its data communications products.

The service is available from about 100 Western Union service centers.

When there is an equipment problem or question, the user can call a toll-free number for diagnostic assistance. If required, the company can dispatch a service engineer from a local service center, according to a WUIS spokeswoman.

All trouble reports are entered into a central computer file and WUIS personnel monitor any problem until it is resolved.

Cost for the maintenance service is based on a monthly charge of $50 per installed unit or a per-call charge of $30/hour for time and materials, she said from 82 McKee Drive, Mahwah, N.J. 07453.

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Terminal Transactions

Replaces Leased Lines With Dial-Up

College Keeps Eye on Costs While Upgrading Network

By John P. Hebert
Of the CW Staff

JACKSON, Miss. — When Jackson State University here recently enhanced its academic computing system, partially funded by the National Science Foundation (NSF), by upgrading its computer system and the number of network users, it took measures to keep communications costs down.

Jackson State's DP system and network started serving the university and other local educational centers in Mississippi in 1974. Today, it provides processing and networking capabilities to eight four-year and junior colleges and 10 high schools up to 170 miles away, according to Dr. Jesse C. Lewis, director of the Computing Center and the computer science department.

In January 1974, the school began providing primarily mathematics-oriented computing based on its IBM 360 mainframe through an IBM 2702 communications controller and leased lines to local schools and colleges.

The terminals were restricted to a transmission speed of 10 char./sec at that time, Lewis said. When it recently upgraded to a 768K-byte IBM 370/145, it also obtained an IBM 3705 front-end communications controller to achieve 30 char./sec transmission.

In addition, the school decided to replace the leased AT&T lines with Bell's Wats dial-up facilities to save money because a number of users outside the telephone exchange for Jackson State had been added to the list of network users.

The In-Wats approach allows these network users to dial in from the distant locations and appear to the CPU as local terminal users, according to the computing center director.

The satellite users communicate with the central site through Texas Instruments, Inc. Silent 700 keyboard/thermal printer terminals, except on two college campuses where AT&T asynchronous Dataspeed 40s are used to communicate at the upgraded 30 char./sec transmission speed, he said.

There are a total of 28 terminals which help provide instructional and research computing. Some colleges are now using the network for social science disciplines as well as the mathematics applications, according to Lewis, who developed the system.

But as more and more students and teachers realize the potential of the computer, greater demands will be made for programs to assist those studying the humanities in general, Lewis pointed out.

In addition, there is a commitment to NSF to increase the use of computers in disciplines other than mathematics, he noted.

"Perhaps in the near future a history student writing a paper on British imperialism will be able to sit at a computer terminal and ask for a list of all wars involving England during the 17th and 18th centuries, giving dates and adversary nations.

"Or a law student might ask the computer to index precedents set by state courts in cases involving public utilities and right of eminent domain," Lewis said.

Besides solving academic problems from remote locations, the computer system is also handling administrative DP for the university as well as other processing not related to the network.

Lewis said he developed the networking system with IBM hardware at the central site because he was familiar with it before he started the job at Jackson State.

At some sites, however, Lewis would have liked to install either Digi-Log Systems Corp. terminals or Bell Dataspeed Model 43s, but the state had an obligation to go with the lowest bidder when the present terminals were installed, he said.

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Intelligent CRT From Research Allows Multipage Transmissions

MINNEAPOLIS — Research, Inc. has introduced the 4041, an intelligent CRT terminal which allows multipage storage, editing and transmission at 16 rates up to 19.2 kbit/sec, according to the firm.

Other standard features include block or character transmission, a 1,920-char. display, 3,640-char. memory, upper/lower case typewriter-style keyboard and compatibility with Bell 103 or 202 modems, Research said.

Editing features include character and line insert and delete. The 4041 can transmit a line, a page, a partial page or the entire memory contents, the company added.

A microprocessor bus-oriented configuration is used with a 3K read-only memory firmware package and a 4K random-access memory (RAM) buffer. Both the buffer and firmware storage can be expanded, a spokesman noted.

Options which can be added to the basic $1,750 4041 include full polling with message parity, 15 function keys, four pages (about 7,280 characters), a peripheral interface, an edit keyboard and a detachable keyboard.

Research can be reached at P.O. Box 24064, Minneapolis, Minn. 55424.

Tally Device Prints At 120 Char./Sec

KENT, Wash. — Tally Corp. has introduced a 132-column teleprinter that reportedly sustains 120 char./sec printing.

The Model T-1612 is available in keyboard send/receive (KSR) and receive-only (RO) versions. It utilizes bidirectional printing, is rated at 1,600 bit/sec and uses an internal microprocessor to compute the shortest distance to the next print position.

Standard features of the teleprinter include switch-selectable 300- to 9,600 bit/sec operation, parity checking, unattended operation, half- or full-duplex operation, a 1K-char. buffer and three serial interface configurations, Tally said.

Options include local or remote horizontal tab selection, 12 char./in. printing, 6- or 8-line spacing, answerback and 2K- and 4K-byte buffers, a spokesman noted.

The standard keyboard features an Ansi layout. A numeric pad and other keyboards are optionally available, according to the firm.

Prices for the Model T-1612 start at $3,490, Tally said from 8301 S. 180th St., Kent, Wash. 98031.

System Offered as Kit

SAN ANTONIO, Texas — The Southwest Technical Products Corp. CT-64 terminal system kit with an optional CT-VM CRT reportedly provides everything needed for a complete stand-alone terminal system.

The kit features display capabilities of 16 lines of 32- or 64 char./line, scrolling or page mode operation, upper/lower case characters, reversed character printing, control character printing, cursor control and control character decoding, according to the firm.

The kit includes a power supply, keyboard, serial interface, beeper, assembly instructions, chassis and cover and costs $325. The optional CRT is sold assembled, requires the CT-64's power supply and sells for $175, Southwest said from 219 W. Rhapsody, San Antonio, Texas 78216.

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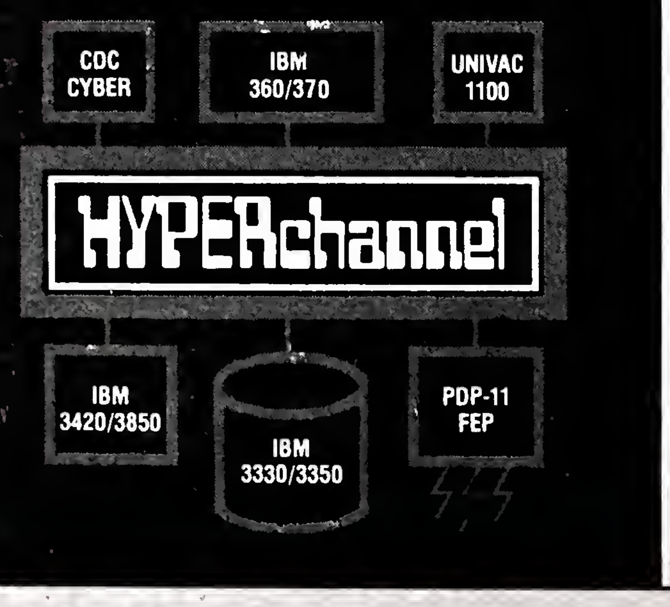

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Terminal Transactions

Portable Digi-Log Telecomputer Features Teletype Compatibility

HORSHAM, Pa. — Digi-Log Systems Corp. has a "portable glass teletypewriter" for use in time-sharing, academic and business applications.

The Telecomputer II is contained in a briefcase-sized carrying case and includes a 5-in. CRT, 300 bit/sec acoustic coupler, teletypewriter-style keyboard and a communications controller, according to the company.

The unit is said to be Teletype-compatible and operate asynchronously in half- or full-duplex modes in Ascii discipline.

A thumbwheel switch allows selection of transmission rates from 50- to 9,600 bit/sec. Current-loop and RS-232 interfaces are available in addition to the acoustic coupler; printer output for either interface type is also provided, Digi-Log said.

The character size of the Telecomputer II can also be selected for either 40- or 80 char./line densities. Sixteen lines of either 640- or 1,280 characters can be displayed.

At the higher character density, the terminal can be used for unit record and teleprinter emulation, Digi-Log said.

Interactions are held in the terminal's screen memory for reference in the roll mode or page mode. In the page mode, the spokesman noted, the operator or host computer can clear the screen with one command and start new pages.

The Telecomputer II can be removed from the carrying case and used with any size video monitor, the company added.

Optional features include switch-selectable parity, addressable cursor and upper or lower case character display.

The terminal costs $1,995 in its basic form from the company at Babylon Road, Horsham, Pa. 19044.

Datamedia Unit Programmable

PENNSAUKEN, N.J. — Datamedia Corp. has introduced the Elite 4000A programmable terminal system designed for large business, educational and engineering users or OEMs.

The 4000A is said to be a modular computing system with an 8-bit word length; it is built around an LSI microprocessor and has a detachable keyboard.

The system features block-oriented display organization for insertion, deletion and rearrangement of text; interrupt-driven vectored I/O; and direct memory access capability, the company said.

Expandable display memory to 32K, expandable I/O and expandable character sets are additional features, it added.

The Elite 4000A is priced at $2,100 in its basic form in quantities of 100, Datamedia said from 7300 N. Crescent Blvd., Pennsauken, N.. 08110.

CDC Micro-Controlled CRT Offered for OEMs, Large Users

MINNEAPOLIS — Control Data Corp. has a microprocessor-controlled keyboard/CRT terminal for use in minicomputer systems in OEM-supplied information terminal subsystems or by large user sites.

The CDC 92456, an addition to the company's 92450 series of OEM CRTs, offers local or remote data entry or editing capabilities to match the user's environment, according to CDC.

A spokesman for the firm said a basically unaltered version of the OEM terminal will probably be available for end users by the end of 1977 and will probably become part of the 750 terminal series as the Model 756.

When used as a data entry and display device in a terminal subsystem connected to a remote CPU, the 92456 is said to provide data editing capabilities at the terminal site, resulting in lower communication costs and required CPU resources.

When connected directly to a minicomputer, the terminal receives edit commands from the host after transmitting all keyboard operations to the CPU, CDC said.

The 92456 displays up to 24 lines of data with a density of 80 char./line. Data can be transmitted asynchronously in half- or full-duplex modes at speeds from 110- to 9,600 bit/sec.

The terminal's detachable keyboard allows entry of 128 displayable characters, including standard 64- and 96-character upper/lower case Ascii sets, and contains a numeric pad, the company said.

OEM prices for the CDC 92456 begin at $1,595 for the basic entry/display unit and $1,795 for the unit with full edit functions and user-defined function keys.

Lower prices are available on volume orders; deliveries will begin in July, according to CDC, which can be reached at Box 0, Minneapolis, Minn. 55440.

No Wait

Instead of waiting in line, customer at one of 22 San Diego Federal Savings and Loan Association offices uses an IBM 3606 to inquire about the status of her bank account. San Diego Federal is reportedly the first to use the IBM terminals for customer inquiry use. The terminals are tied to the bank's 370/145 CPU.

MSI Data Entry Unit Powered by Battery

COSTA MESA, Calif. — MSI Data Corp. has introduced a portable data entry terminal which it said can be programmed and uses auxiliary batteries to retain its memory when the terminal power is turned off.

The MSI/77, which incorporates CMOS memory, was designed for retail ordering, sales reporting, inventory and other data-gathering applications.

Four of the penlight batteries provide up to 64 hours of operation for the terminal. Battery usage is maximized because of built-in power conservation features such as an automatic 30-second shutoff, MSI said.

To protect data stored in the terminal, two auxiliary batteries provide power to assure retention of memory from data entered on the MSI/77's standard 10-key touchpad.

The auxiliary batteries can retain information stored in the terminal's CMOS memory for up to 48 hours because of the low power consumption characteristics of the storage medium, according to an MSI spokesman.

The keyboard is programmable for setting item entry and transmission characteristics, the company said.

The terminal transmits at 110- to 1,200 bit/sec, with 1,350 bit/sec transmission available with an MSI Source 2100 compatibility option. The MSI/77 communicates in a 7-bit Ascii code plus parity, MSI said.

It is also equipped with an acoustic coupler to transmit data, the company added.

The MSI/77 is available in a 4K and an 8K version. They cost $990 and $1,190 respectively, MSI said from 340 Fischer Ave., Costa Mesa, Calif. 92627.

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Wang will display its complete line of small business computers and word processing systems. Demonstrations will include telecommunications and distributed data processing based on Wang's small business computers and turn-key and other systems applications, for the first time, will be new additions to the high and low ends of the Wang product line including the new ultra fast 2200VP processor for "hands-on" operation by visitors.

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UK Center Cites Lack of Planning

Few Users Appreciate Need for Standby DP Capability

By Frank Vaughan
Of the CW Staff

MANCHESTER, England — If your sole plan for standby DP capability consists of a "gentleman's agreement" with the vendor to bail you out, you may sink when a disaster strikes. Informal arrangements for emergency standby are not enough, according to "Planning for Standby," a report published by the National Computing Centre Ltd. here.

Most DP facilities fail to appreciate the need for formal standby arrangements because of a general lack of understanding of all the problems involved, the report noted.

It is easy to see the lack of awareness of the need for adequate plans to deal with situations that call for alternative DP capability, the report said.

Some of the signs showing the lack of planning awareness, according to the report, include:

- The general concentration on hardware and software standby capabilities with few, if any, measures to deal with personnel-based problems.
- The absence and generally low level of insurance coverage for business interruption losses.
- The informality of many mutual and reciprocal DP standby arangements and the almost total lack of medium- and long-range planning.

One of the key factors for the apparent indifference toward planning for DP standby is the lack of freely available basic information. This information should include disaster case histories, facts and figures, techniques available for planning and the problems in newer and expanding technologies, the center recommended.

"Manufacturers could ease the problem of assessing the need for standby capability by providing assurances in terms of assistance or replacement equipment that might be provided following a disaster," the report suggested. Delivery times would also be helpful, it indicated.

Temporary accommodation should be another concern in planning for DP standby. The physical facilities could be seriously damaged or even destroyed, but the hardware may receive only minor damage. These possibilities require special attention, the report said.

Vendor Arrangements

With regard to manufacturer attitudes, the report said contractual commitments from manufacturers regarding the replacement of equipment would be unrealistic. However, it did note certain assurances have been obtained from some manufacturers by individual customers and suggested that such assurances be sought.

Failing this, the report suggested, any contingency plan drawn up should deal with the assumption that hardware would take about a month to replace. It also noted the replacement of hardware not in current production or not supplied by one of the major manufacturers may be subject to a much longer delay.

The use of proprietary software on a standby computer rather than the "home" computer could pose a problem, the report noted. "Would it not be in the general good if a standard clause could be included in the software contracts extending the terms of the license to permit use on a standby machine?" the report asked.

Short-Term Needs High

In a survey of 138 of its member organizations in the UK, the center found the incidence of hardware environmental failure causing breaks of one to three days was high, indicating a strong need for short-term standby capabilities. It appears, however, that installations have been able to make suitable temporary arrangements, according to the report.

Very few of the installations, however, were able to estimate the costs incurred by the interruptions or to claim insurance for any of the losses, the center noted.

"It is clear there is a need to distinguish between short-term standby arrangements for failures of, say, individual items of hardware and disasters of a major nature to

(Continued on Page 48)

Bits & Pieces

OBM OCR-ONE Gets Option

MELBOURNE, Fla. — Optical Business Machines, Inc. (OBM) has an option to permit its optical character recognition (OCR) scanner to recognize the matric numeric font that is printed by Florida Data Corp.'s PB-600 matrix printer.

The Laser OCR-ONE can be programmed to read documents containing a mixture of OCR-A, numeric handprint and matrix numerics.

This feature is currently available for installation. A complete system, including the PB-600 printer and matrix numeric recognition, leases for $2,500/mo from the firm at 804 W. New Haven Ave., Melbourne, Fla. 32901:

'Zap Trap' Records Spikes

MILLIS, Mass. — A transient voltage detector that will record and hold both positive and negative "spike" measurements for up to 30 minutes is available from Industronics, Inc.

The Zap Trap gives measurements of transient voltages on any standard 10V dc meter and reportedly has an accuracy of +20% with 1 megohm input impedance. The unit handles input voltages up to 1kV and has a maximum output of 10V.

The Zap Trap costs $99.95, the optional recorder sells for $176 and adapters are $7.50 each from Industronics at 115 Pleasant St., Millis, Mass. 02054.

UPS Available From Nova

NUTLEY, N.J. — Nova Electronic Manufacturing Co. has a solid-state 5kVA uninterruptible power system (UPS) with a three-year warranty.

The unit costs $4,995 from the firm at 263 Hillside Ave., Nutley, N.J. 07110.

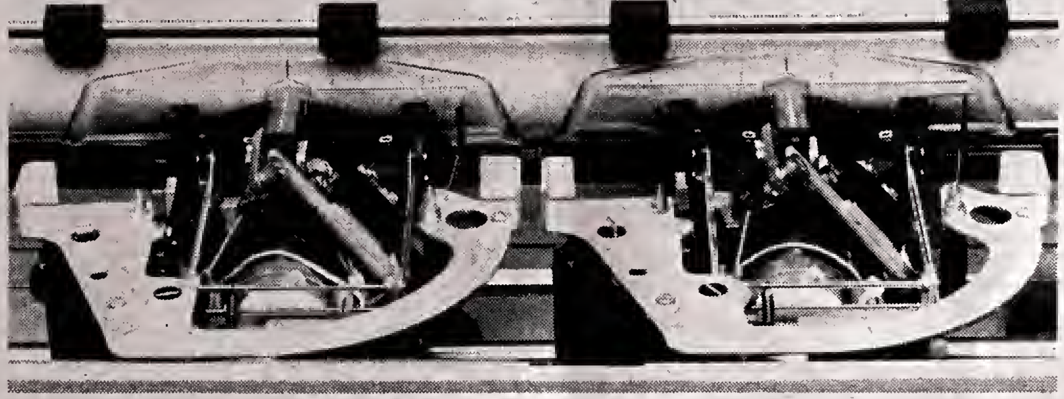
Micros Drive Double-Headed Printer From Qume

HAYWARD, Calif. — Qume Corp. has a two-headed character printer capable of producing copy at the rate of 75 char./sec in either parallel columns or solid text, according to the firm.

The Micro 3 Twintrack allows the user 192 on-line characters, twice the number available on a standard 96-character printwheel. The bidirectional printer can produce copy in up to four colors, Qume said.

The two printing mechanisms are spaced 5.5 in. apart, each in parallel with the other. The width of the printing area is 26.3 in. and the overlap printing area is 15.3 in. with a combined printing function capability in the overlap area, the firm said.

The two printing mechanisms operate independently and concurrently. Each is driven by its own microprocessor. A line buffer reportedly allows the printing mechanisms to look ahead to determine which printwheel needs to be used for a particular letter, symbol or sign.



Qume Micro 3 Twintrack

Modes of Operation

The printer has two operational modes, the firm said. The first uses two different printing wheels for the 192 different characters. Used in this fashion, operating speed is up to 45 char./sec, it indicated.

The second mode is to use two identical printwheels for a possible print speed of up to 75 char./sec, Qume said. Both printing mechanisms can be used concurrently, one printing on the left side and one printing on the right side of the page. This also permits full utilization of the 26.3-in. platen, a spokesman said.

The Micro 3 Twintrack sells for $2,725 from Qume at 2323 Industrial Parkway West, Hayward, Calif. 94545.

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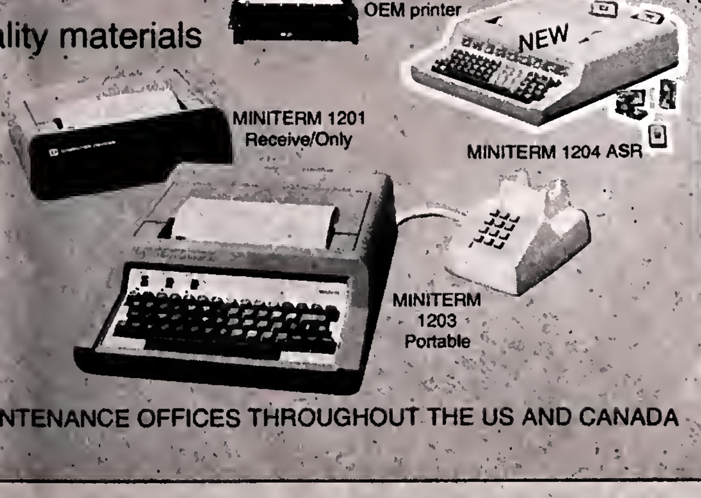

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$\frac{m-m+1}{2m-m+1}\cdot\frac{b}{c}\int\frac{x^{m-1}\,dx}{X^{m+1}}$
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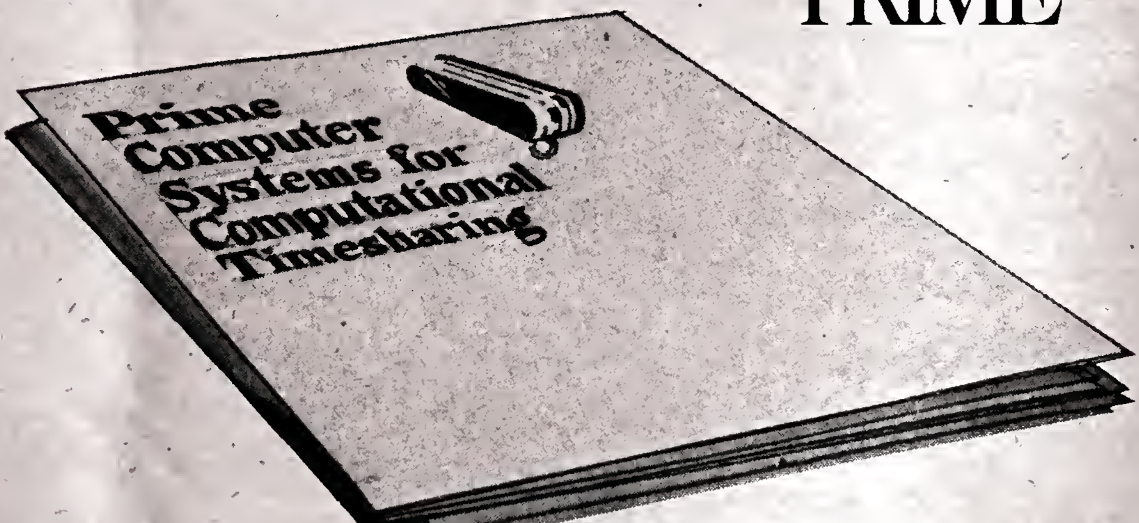

Prime can help

Cancels Original Decision

User Gains Advantages Swaying From Upgrade Path

By Frank Vaughan
Of the CW Staff

BEAUMONT, Texas — When Gulf Coast Machine and Supply planned to upgrade its NCR Corp. Century 151, it almost took the logical step and purchased a Century 201.

But the firm purchased an NCR Criterion 8550 instead and as a result received greater computing power at less cost, according to a spokesman.

"We had to upgrade or expand our Century 151 because of increased demand on the system. We very nearly bought the Century 201. In fact, we had already decided to purchase one when we looked at the age of the Century line," Dan Robinson, DP manager, recalled.

"We figured NCR wasn't going to keep adding to the Century line and decided the Criterion was probably going to become the main NCR line. If we need to upgrade in about five years, we want to get the biggest trade-in we can on our current hardware, so we bought the 8550," he said.

"Actually, the 8550 is rated somewhere between the 201 and the 151, yet the purchase price was lower than that of the 201. I don't know how NCR figured that out, but we didn't argue, we just jumped on it," he added.

Smooth Installation

The installation of the system went smoothly, according to Robinson. NCR delivered the equipment "almost to the day that the salesman promised."

Instead of receiving the entire system in one fell swoop, Gulf Coast had NCR deliver one unit at a time and get it operating with the old system.

"I've never had any complaints with the hardware," Robinson said. "The peripherals are as reliable as ever and I really have no complaints in that direction."

The transition from Century to Criterion wasn't completely smooth though, he indicated.

Software Difficulties

"We did have some software difficulties that left us in a somewhat rocky environment for three or four weeks," Robinson recalled. "The operating system we were using with the Century was not thoroughly debugged for use on the Criterion. [NCR] had to send a software expert in to get it all straightened out.

"We eventually purchased the B3 operating system for the Criterion. Other than that, we have had no real difficulties," he said.

The Criterion at Gulf Coast is configured with 192K of memory, a communications multiplexer, seven CRTs, two NCR 658 100M-byte disk drives, two NCR 656 10M-byte drives and an NCR 647 printer.

It has been installed since last October and Robinson reported almost no downtime. "In fact, I don't think NCR realized how good the machine is. I figure we are paying way too much for maintenance. All the guy does is come in once a week and do a little preventive maintenance," he said.

Control of Materials Set as Seminar Topic

NEW YORK — A three-day seminar on "Control of Material Flow" will be held here June 1-3 by the University of Chicago.

The seminar will look at management information systems for purchasing, plant scheduling, inventory, distribution, warehousing and shipping. It will focus specifically on demand forecasting, inventories, replenishment rules, service level, warehousing and freight control, according to a spokesman.

The seminar is geared toward managers in DP and information services who also have responsibility for management systems design and implementation. It was also developed for managers with direct responsibility for purchasing, plant scheduling, inventory, distribution, warehousing and shipping as well as managers in manufacturing, marketing or sales with responsibility for delivery service.

The seminar will enable users to define solutions, set criteria for choosing the appropriate DP hardware and software and plan systems projects, the university said.

Attendees may present a major logistics question to the seminar if accompanied with supporting data, it noted.

Georges Brigham, senior vice-president of Manalytics, Inc., will lead the seminar, which will also be given in Chicago in September. There is a $435 tuition fee per person plus a $60 registration fee per company.

Registration can be completed by calling toll-free (800) 233-7450 or, in New York State, calling (212) 953-7266 collect.

All registrations will be confirmed by the University of Chicago, Center for Continuing Education, 1307 East 60 St., Chicago, Ill. 60637.

Tally Matrix Printer Features Dual Speed

KENT, Wash. — Tally Corp. has introduced a matrix printer that prints at 375- and 500 line/min and features a 9 by 7 half-space matrix font.

The T-5000 also includes full line buffering, a 64-character set, 11 in./sec slew speed, scroll ribbon and 132 print positions at 10 char./in.

Other features include 6 line/in. line spacing, dual adjustable tractors, gate loading, zero to 99 line forms length select and an acoustically designed noise enclosure.

The T-5000 features the helix printing principle; all printer functions and printed characters are electronically controlled by an integral microprocessor, the firm said.

The printer offers a selection of interface controllers for a variety of minicomputers and for emulation of other printers, the firm said.

Options include a 9 by 9 half-space font, double 96-character set, compressed printing, self-test, eight-channel tape or electronic VFU, 6- or 8 line/in. spacing and special character sets.

The price of the unit starts at $8,950. Tally is at 8301 S. 180 St., Kent, Wash. 98031.

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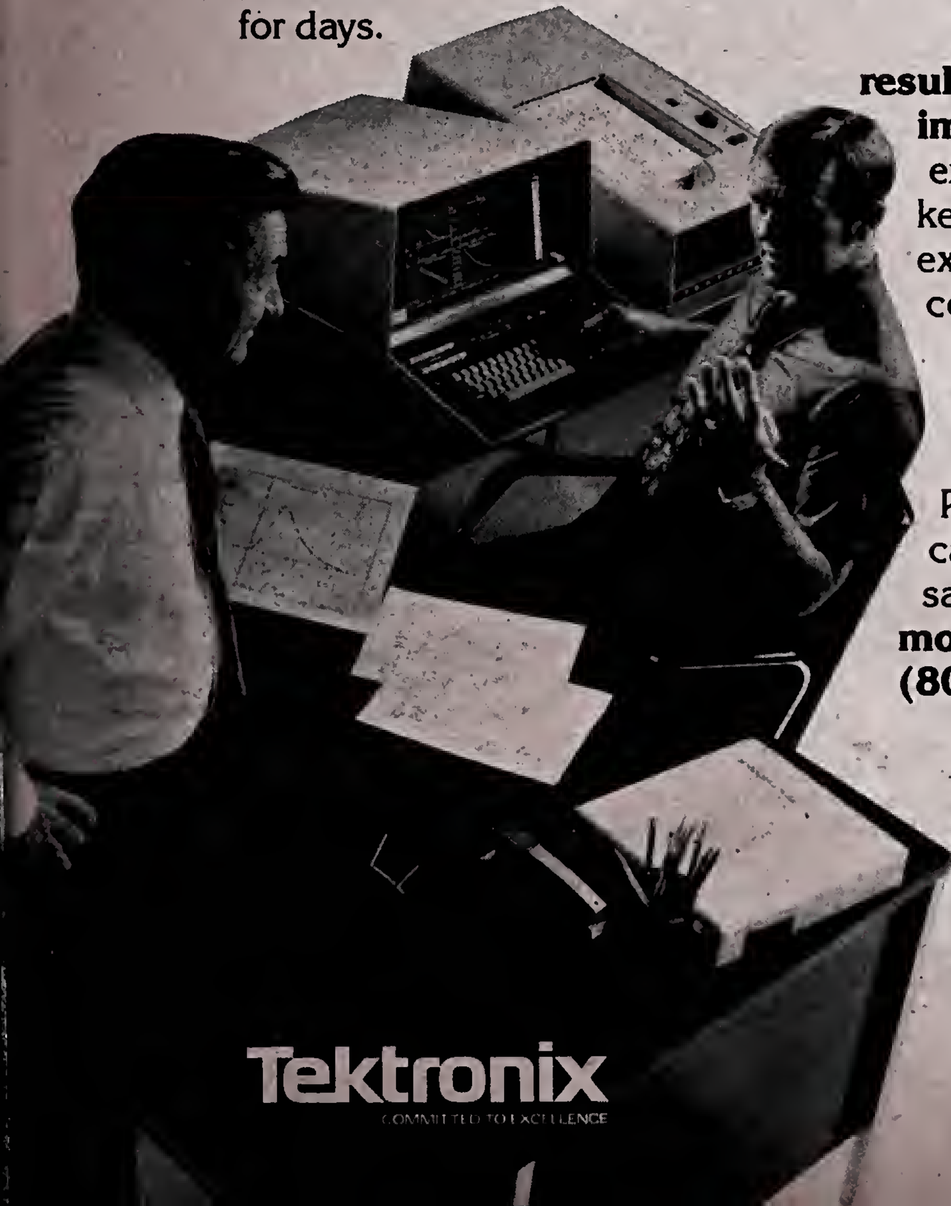

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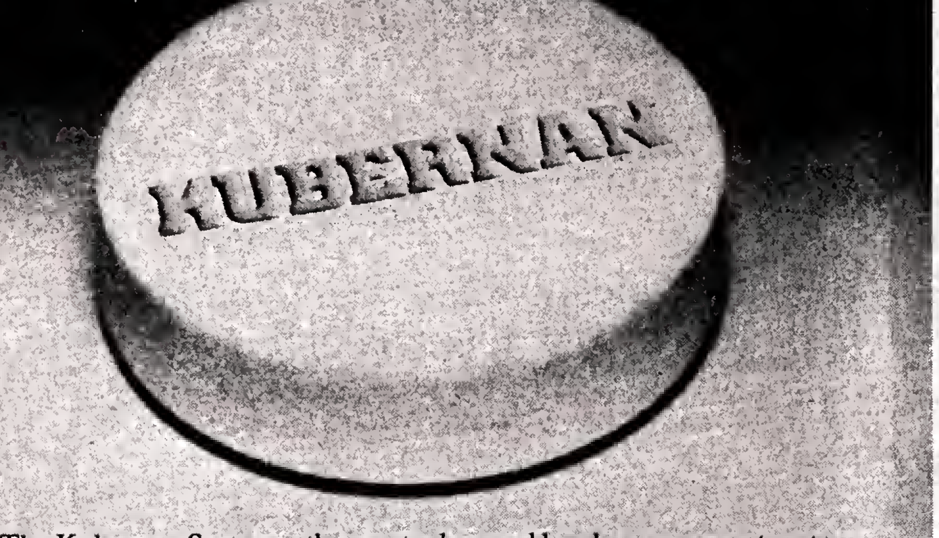

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Exploring DDP — Part 1

Single Definition of 'DDP' Not Seen Coming for Years

By Richard Weber
Special to Computerworld

Most articles dealing with distributed data processing (DDP) reach the conclusion early that distributed or decentralized processing is indeed becoming a trend in fact as well as in concept. Some go as far as to say decentralization is inevitable.

While most articles agree that DDP is a cost-justified approach to DP, what they don't always agree on is a definition. Because DDP is a broad-based concept, users will probably not see a single definition for years, if ever.

But the thrust of the different definitions is largely the same. Generally, the centralized DP organization has one functional department responsible for supplying DP services to all other departments. Synonymous with centralization is one or more mainframes operating in a batch-oriented mode, in combination with all of the services required by a community of users, such as time-sharing or inquiry/response.

In a DDP organization, each operating group has its own minicomputer or at least has access to local intelligence. In other words, the people who generate and use the data have their own computer processing power. Usually, the systems are interactive.

Essentially, DDP is the allocation of computer resources in smaller increments. The individual units are asociated procedurally or functionally into an overall system structure. This is a new way of managing the DP organization.

Key Word

The key word in these definitions is "organization" - the corporate structure. A company that has a strong centralized management and where DP functions basically revolve around the same data may find a single central DP group best suited to its needs.

On the other hand, a large corporation or conglomerate with many different groups requiring many different types of processing functions should consider DDP. Most large corporations are finding it is no longer possible for a single central computing facility to supply their many disparate users with timely, responsive DP support.

Nor is it economical. It requires a tremendous amount of overhead to keep a large DP facility operational, and hardware cost is only a part of it.

The people required are also a part of it. There is also the internal systems overhead required to make the mainframe responsive to a diverse range of user applications. The CPU time and memory associated with systems management can be extremely high and complex enough to frighten the bravest systems analyst.

Bigger No Longer Better

Until recently, the corporate DP manager didn't have a viable alternative to a centralized operation. Bigger was better. Now, however, minicomputers, to a large extent, are making DDP possible. The small computers are intended for contained, stand-alone, interactive operations.

A typical minicomputer today has a 700 nsec memory cycle time and a 512K-byte or more main memory capacity. The newest minicomputer memories are becoming increasingly dense, and 64K bytes on a single board is not unusual. The high-density memories are far more reliable than the older memory units.

Most minis have microprogrammed architecture and some supply special commercial instruction sets for character and string handling, editing and word addressing. To increase their performance, the minis are frequently available with high-speed hardware floating-point units and hardware stack facilities.

The most significant aspect of minicomputer technology, however, is the low cost and increased performance. For example, eight years ago a 32K-word mini with a 2.6 microsec cycle time cost over $20,000. Today a computer with the same amount of memory but with a 700 nsec cycle time costs less than $6,000 — a difference of about 70%.

A similar price/performance ratio applies to intelligent terminals, a key component in decentralized systems. It's now possible to buy a simple terminal kit for about $800, not much more than a television set.

This is the first article in a three-part series on centralized vs. decentralized processing by Richard Weber, vice-president of sales for Data General Corp. The series is extracted from a presentation given at the 21st University of Alabama DP Conference held at the university in Birmingham, Ala., earlier this year.

This week Weber discusses the present state of minicomputers in distributed data processing and reviews the problems faced by the DP manager at a centralized DP site. Next week, he will examine some of the specific benefits of a DDP organization.

The second development that makes minicomputers applicable to business DP is in the area of peripherals. Virtually every peripheral device is now available with the small systems.

The general-purpose peripherals for mass storage include 800- and 1,600 bit/in. vacuum column magnetic tape units. For on-line storage, disk units range from low-cost 512K-byte diskettes to 10M-byte cartridge drives to 96M- and 192M-byte disk pack drives. Minicomputers can now support more than a billion bytes of on-line storage.

The list of peripheral devices also includes high-speed line printers and serial matrix printers, CRT displays, 30- and 60 char./-sec printers, card readers and plotters. As with processor costs, the cost of peripheral devices has gone down dramatically in recent years.

Many manufacturers also provide special communications interfaces for high-speed data communications between systems. Typically, they supply asynchronous and synchronous multiplexers with speeds up to 56 kbit/sec.

The software now available with minicomputers is rapidly becoming as extensive and sophisticated as that of mainframes. In addition to disk operating systems for program development work and real-time systems for communications line control, multiprogramming operating systems are being introduced.

These multiprogramming systems give the minicomputer many of the concurrent time-sharing and multiple batch job streams capability of large computers.

Communications Advances

In the area of data communications facilities, often an integral part of distributed systems, significant advances are also taking place.

But there are still some problems in the data transmission field.

The first is that digital networks and packet switches are not available everywhere, nor will they be for a number of years. The second is that these networks and switches deal only with data transmission; they do not address logical procedure and file compatibility, essential when multiple communicating processors are dis-

(Continued on Page 50)

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Also Saves Time, Money

Key-to-Disk Gives Uniform Cleaner 'Overall' Control

SANTA ANA, Calif. — Going from keypunch to key-to-disk data entry technology has helped Prudential Overall Supply here keep better track of its 85,000 customers.

But keeping track of the customer names is only part of the game. Each week Prudential launders an average of three uniforms per customer, and the uniform often has two or three parts. In a typical week, therefore, Prudential may handle anywhere from 250,000 to 750,000 garments, and the paperwork must match each garment to the right customer.

To avoid mixups, Prudential keys its delivery route tickets to the master file of the 85,000 customer records. That way the Prudential drivers in the Santa Ana area as well as the company's seven other California locations can assure that every part of each personalized uniform is returned to the proper person.

Improved Accuracy

For a number of years, Prudential Overall Supply had been using punchcards to enter data into its Univac 9300 for processing to produce the route delivery sheets and other administrative reports necessary to manage the company. "But we changed over to key-to-disk technology," according to Donald C. Lahn, secretary/treasurer of Prudential, "because of the cost savings and greater accuracy."

Prudential replaced its keypunch operation with a CMC 3 keyprocessing system. "There were too many errors being punched into the cards," Lon Kuehl, Prudential's DP manager, recalled, "and, of course, those errors had to be corrected in a verification phase. But now that we've switched to key-to-disk, our operators correct the errors they may make as they go because the keystation locks up and buzzes if a mistake is made while they are entering source documents.

"And when a mistake is made, there's no need to repunch an entire card — the operator just backspaces and keys in the correct character."

Time Savings

Kuehl found there are other ways of saving time, too.

"Using the keypunch system, a separate balance run had to be made before the shift's keypunch batches could be fed into the mainframe equipment," he said. "Now, the balancing is done automatically by the system. The operators don't have to re-sort and rearrange stacks of cards."

While using the keypunch system, four operators were required. Now Prudential needs only two full-time operators and two part-time operators to input the same information.

"But a reduction in personnel was incidental to our original intentions in switching over to key-to-disk," Kuehl explained. "Our main aim was to reduce CPU time, improve accuracy, cut down on card costs and eliminate the need for a balancing run.

"Key-to-disk is also less noisy, neater and, besides, there are no card jams to hold up the operators . . . it's just better all the way around. I would say the biggest single plus is the improved service we're able to deliver.

"We can expand easily, too," Kuehl added. "We can simply plug in another four keystations and double our present capacity."

Prudential had virtually no downtime while making the changeover, he said. "We used both keypunch and key-to-disk in parallel for a while, so we spent a few evenings here in the office. But by the third week our operators had completely switched over from keypunch and were buzzing right along entering the same amount of data.

"After a month on the CMC 3 keystations, their accuracy was far better and their speed was far above their previous keypunch operations. When one of our full-time operators quit, we found we could easily replace her with a part-time operator. So we saved about 12 to 15 operator hours a week.

"The keystations are versatile, too. Any operator can do verification or all four can input or all four can verify. With key-to-disk, it takes only a key change on a regular station to verify."

Using the CMC system, manufactured by Pertec Computer Corp.'s CMC Division in Los Angeles, Calif., the day's input is entered onto magnetic disk. An operator later transfers the shift's batches to tape, even while operators are entering or verifying more data.

"Our computer operator inputs the magnetic tape right into the mainframe," Kuehl said. "There are no extra runs, editing, balancing or correcting to worry about. All that is taken care of in the Keyprocesing phase."

A teleprinter on the CMC 3 prints supervisory reports that tell the status of each keystation and each operator's performance as well as giving an analysis of job costs.

"At the end of the day, I get a printout for that day's work and I can see at a glance the status of every job," Kuehl said. "I also get reports on the number of errors by operator, the amount of records input or the amount of time spent verifying. Besides that, special reports analyzing job performance are available to general management and our clients."

Prudential also uses the CMC 3 Keyprocessing system to enter data for financial and general ledger reporting, payroll and accounts payable and receivable.

"We have basically every software feature available on the CMC 3 system," Kuehl said. "Beside auto batch balance, which saves us a lot of time, we have a multiple format group feature which permits the operator to link related single records into a master record. And we have a batch suspend feature on the system. That allows an operator to close out a batch temporarily, leave to do other work of higher priority and easily start again where she left off."

When Prudential switched to key-to-disk, a substantial savings was made on floor space. Moreover, there was an 80% cutback on card costs.

"Now we have only a few jobs where cards are filled out in the field for later use on our CPU," Kuehl said. "Although I used to order 500,000 cards every three months, I currently order only about 100,000 cards every six months."

With all the 85,000 customer records securely under control, Don Lahn allowed himself a backward look. "Our switch from keypunch to key-to-disk worked out better than we expected. Our only regret is we might have done it earlier."

Users Lacking Standby DP Plans

(Continued from Page 41)

the installation as a whole, such as fire and flood," the report continued.

Arrangements for short-term standby capabilities are generally the responsibility of the DP department, but contingency planning for major disasters is of concern to senior management, it said. The costs of standby arrangements must always be measured against the probability of particular risks occurring and their impact on the business.

The main problems experienced by installations which have recently used standby included logistics (in preparing and transporting work), software (in installation differences), capacity (inability to complete all the work), staff (primarily stress and pressure) and delays (inability to meet operational and production schedules).

Most users had standby plans to cover hardware, but only a small percentage had included communications equipment, the environment, staff and support services. Reported insurance coverage was low. Sites having standby arrangements had no methods of testing these arrangements and no documentation of the necessary procedures, the report said.

The report provides general, hardware, software, communications, environmental, personnel and files checklists to aid in planning. Cataloged as No. ISBN-0-85012-183-3, it is available through NCC Publications, The National Computing Centre Ltd., Oxford Road, Manchester M1 7ED, England.

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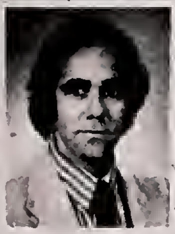

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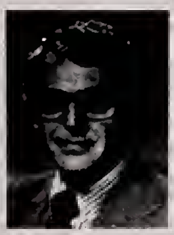

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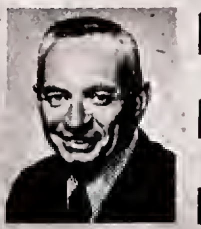

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Service Renews Disk Heads

GOLETA, Calif. — A disk head refurbishing service is available through the Infoextend arm of Information Magnetics Corp.

Infoextend will repair and refurbish disk heads from all major manufacturers and provide users with the equivalent of new parts through the reuse of field-replacement inventory, a spokesman said.

All inspection, mechanical measurements and dynamic electric tests are done on equipment identical to that used in the building of new heads, he claimed.

Additional information and pricing procedures are available from Infoextend at 495 S. Fairview Ave., Goleta, Calif. 93017.

Provides 2.3 Billion Bytes

Telefile Mass Storage System Fits Xerox CPUs

IRVINE, Calif. — Telefile Computer Products, Inc. has introduced an integrated system for expanding and diversifying the mass storage capabilities of Xerox and Sigma CPUs.

The Telefile T3280 mass storage facility includes disk drives, controllers, interfaces and dual switch units to provide up to 2.3 billion bytes of storage, the firm claimed.

Each T3280 system can incorporate up to eight disk spindles. Two different types of disk drives, including the IBM 3350 "Winchester" type, can be accommodated, with removable or nonremovable media and moving or fixed heads, a spokesman said.

An optional dual port allows each drive to be accessed by two processors or by a single processor through two fail-safe channels, the spokesman claimed. Dual switch modules expand this capability, allowing up to four processors to share a common data base, he added.

The T3280 facility uses a Signetics Corp. 2901 microprocessor as its logic control element. The controller performs address translations to select the disk and head, serial/parallel conversions, error detection and correction, rotational position sensing and other status operations, he explained.

Individual disks are attached to the controller in a radial or star interface; individual cable or driver/receiver malfunctions will not affect any of the other drives, he claimed.

The complete system is plug-compatible with all Xerox and Sigma processors, Telefile said.

A typical configuration with one controller and 2.3 billion bytes of mass storage costs $211,025 from the firm at 17131 Daimler St., Irvine, Calif. 92714.

Single 'DDP' Defininition Elusive

(Continued from Page 46)

tributed.

Networking now available from some mainframe and mini manufacturers tries to overcome this problem and make the network logically transparent to the applications programmer.

Unfortunately, networking still carries the high overhead of any generalized capability: reduced response time, large memory requirements, reduced line bandwidth. It also restricts the user to one vendor's equipment.

It will be some time before file and procedural compatibility will allow users to network different vendors' systems. But newer networking schemes should overcome these problems. Of course, many users do not need networking to implement a viable DDP network.

Some progress is being made in the area of industry standards for interfacing, however, also making network implementation easier.

The X.25 packet-switching protocol has been adopted as the international standard for data sharing and file transfer between different vendors' hardware.

This message protocol uses Higher Level Data Link Control mechanisms, but the U.S. protocol and IBM protocol are not too much different. IBM's encryption algorithm will probably become the industry standard for data security as it moves over communications lines.

With these advances in minicomputer performance, peripherals, software and communications facilities, small systems have earned a place in business DP organizations.

Centralized Site's Problems

Before examining the specific advantages of a decentralized network of small computers, a review of the problems the manager of a centralized DP organization faces is in order.

Broadly speaking, the problems are job mix, job turnaround, response time, system throughput and system expansion.

Typically, the central site system must support several different modes of operation, based on user demands. They may include transaction-oriented activities like multiterminal inquiry/response applications, batch jobs like payroll, report generation, time-sharing operations and interactive engineering-type applications.

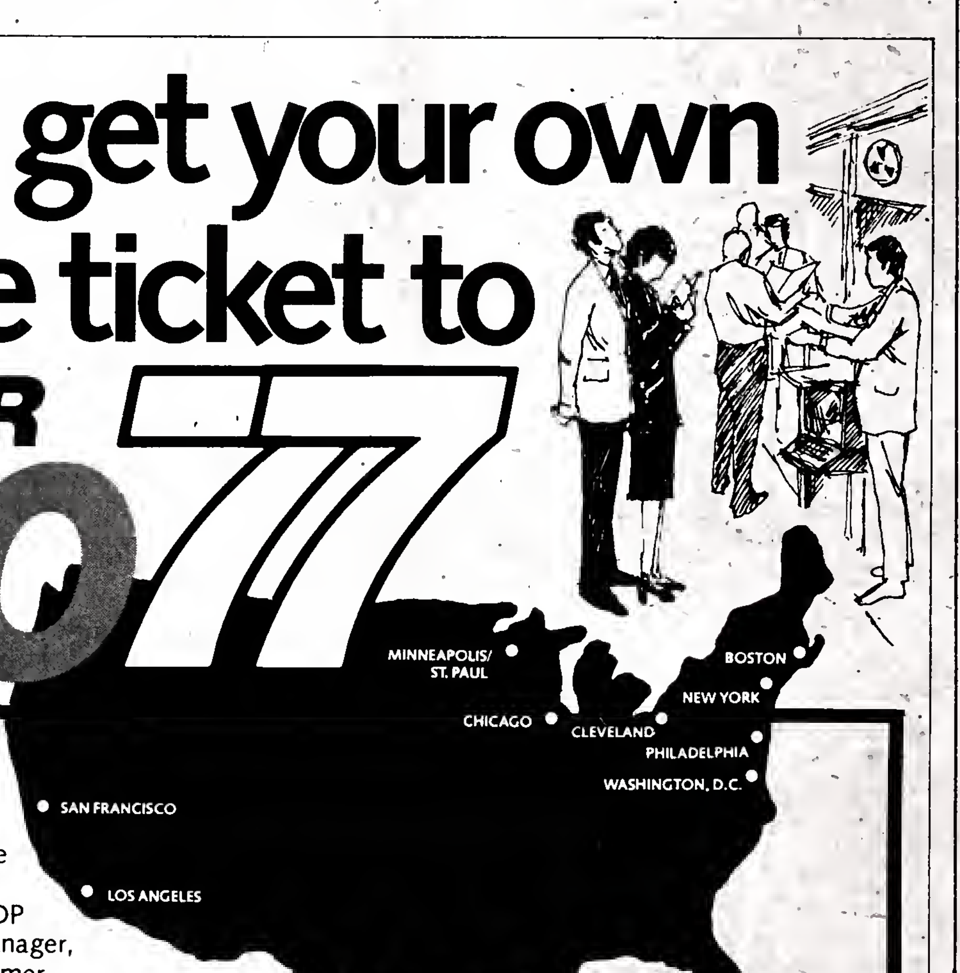
A typical system begins with batch jobs that run very efficiently when never interrupted. But to accommodate all potential applications, multiple interactive time-sharing users are added to the system.

Real-time transaction activities are next: they must be on-line and, like the time-share users, may take priority over batch jobs. The batch monitor now gradually becomes inefficient because it is constantly interrupted by transaction-driven priorities.

As more and more user demands must be met, a degradation cycle begins. Response time for transaction and time-sharing activities deteriorates because job turnaround deteriorates. The processor spends most of its time scheduling and rescheduling itself.

Effective work tails off when batch jobs begin to stack up and the operating system begins "thrashing." The answer, of course, is conversion to a bigger CPU, more memory or the addition of another processor.

As more and more applications are added, however, the cycle begins to repeat itself. Another important problem with a single central system is that in the event of a system failure, the entire corporate DP function stops.



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Mini Bits

Micropolis Floppies Store Up to 630K in 5-1/4 In.

NORTHRIDGE, Calif. — A family of integrated floppy disk systems from Micropolis Corp. has the storage capacity of 8-in. disks in a 5-1/4-in. format, the company claimed.

The Metafloppy family of four systems offers plug-in microprocessor compatibility and a Basic software package, the firm said. The drives are available in single- and dual-drive versions with capacities ranging from 143K- to 630K bytes.

The smallest Metafloppy system, the 1043-Mod I, is a single drive using a 35-track disk with a capacity of 143K bytes, compared with 70K bytes for other 5-1/4-in. units at a price of $945, which includes power supply, controller, interface cable and Basic software.

The Model 1043-Mod II system uses a 77-track disk with a 315K-byte capacity; it is priced at $1,095.

The Model 1053-Mod I, a dual drive, stores 286K bytes at a price of $1,545 while the Model 1053-Mod II, also a dual drive, has 630K bytes and costs $1,795.

The Metafloppy controller can accommodate up to two dual or four single drives for a total of 1.26M bytes of formatted disk storage on-line, a spokesman said from 9017 Reseda Blvd., Northridge, Calif. 91324.

Diablo 1620 Options Offered

MOUNTAIN LAKES, N.J. — Data Access Systems, Inc. has announced two options for Diablo 1620 printers that it said make them attractive to minicomputer users.

The options, a current-loop interface and a custom-designed stand, are available separately or with the Diablo 1620.

The printer with forms tractor costs $2,895. The current-loop interface costs $100 and the stand assembly costs $135. Each option's price includes installation, the firm noted from 100 Rt. 46, Mountain Lakes, N.J. 07046.

Motorola Adds 'Exordisk'

PHOENIX — Motorola, Inc. has an IBM 3740 format-compatible floppy disk system consisting of a dual diskette drive unit, controller, software, cables and documentation.

The system, called the Exordisk II, provides 512K bytes of nonvolatile memory on two diskettes.

The disk controller module interfaces to the bus of the exorcisor. A disk-based operating system allows random or sequential file organization, Motorola said.

The Exordisk II costs $3,300 from Motorola Semiconductor Products, Inc., P.O. Box 20294, Phoenix, Ariz. 85036.

Software, Hardware Compatibility

CA Unveils Family of Naked Mini-4 CPUs

By Esther Surden
Of the CW Staff

IRVINE, Calif. — Computer Automation, Inc. today announced its OEM Naked Mini-4 family, ranging in size from a 16-bit minicomputer at microcomputer cost to a supermini-type system, according to a spokesman.

The family includes three processors — the LSI 4/10, 4/30 and 4/90 — which are both applications software- and peripheral-compatible, the spokesman said.

Each of the systems features an instruction repertoire that is either a subset or a superset of the other family members.

The family is not software-compatible with earlier CA systems, although conversion aids are available, he added.

Designed for such applications as word processing systems, intelligent terminals, instrumentation control devices and point-of-sale systems, the smallest member of the family — the 4/10 — has 90 instructions.

The 4/30, designed for automated banking, medical systems, process control and data acquisition users, contains 107 instructions while the 4/90, designed for use in multitasking applications and industrial control and data communications systems, features a complement of 119 instructions, the spokesman said.

The 4/10 incorporates two custom N-channel MOS chips, 4K words of random-access memory (RAM) and four I/O channels on a half-size circuit card. Battery backup can be included on-board as an option, the firm said.

The 4/30 includes a chassis, power supply and console in addition to the features of the 4/10 while the 4/90, said to have twice the speed of the 4/30, incorporates up to 64K words of memory and includes chassis, operator's console and a power supply.

The basic LSI 4 CPU is a 16-bit machine with six levels of priority vectored interrupts. Up to 64K words of memory can be directly addressed and both byte and word operations can be handled, CA said.

Many different memory sizes and increments are available, the firm noted.

Family Features DIOS

A distributed I/O system (DIOS), previously a feature of CA gear, is also a feature on the LSI 4 family.

DIOS allows firmware-controlled I/O processors, called Picoprocessors and packaged in intelligent cables, to interface most standard peripheral devices to the systems, the spokesman indicated.

A user-programmable version can be customized for nonstandard peripherals, he added.

In addition, a half card I/O controller can control up to eight programmed I/O devices or four direct memory devices, CA said. Multiple cards allow the attachment of more than eight devices.

The systems can be packaged in a variety of chassis and with different consoles and power supplies. Both operator, programmer and a remote desktop programmer's console that can be plugged into the operator's console are available.

The software for the system is based on two assemblers — dubbed Omega and Macro — which "provide a range of capabilities from a paper tape environment to powerful macro features in free-standing and operating system environments," the spokesman reported.

The assemblers are available in a basic 4K version, an 8K version with editor or a 12K version with additional macro features.

A library of free-standing development aids, including a package of loaders, dumps and debug utilities for small memory sys-

(Continued on Page 56)

Mainframe-to-Mini Conversion Proves Cost-Effective for S&L

By Esther Surden
Of the CW Staff

MUNSTER, Ind. — A savings and loan (S&L) association here has downgraded from an IBM 370 mainframe to an IBM 3 in a move that has already proven cost-effective, according to the user.

"We had an IBM 370/135 and were not accomplishing programs we felt we needed to accomplish," Dan Augustine, executive vice-president of First Federal Savings and Loan Association of East Chicago, said.

The applications for the 370 had to be written in Assembly language and the firm was unable to successfully put several additional applications on its system.

"So we looked around at other systems," Augustine continued. "We had to decide whether to stay with what we had, go to another in-house system or go to a service bureau."

The firm visited several users in its attempt to find a system that could accommodate its processing load and the additional applications it needed on-line.

Finally, representatives visited "a small association in the area that was using an IBM 3/15" and the hardware looked promising, he said.

The savings and loan leased the IBM 3 "to find out if we liked it" and sold its 370, according to Augustine. The programs for the 370 were effectively junked, he added.

The system with operations and maintenance included costs the organization about $60,000/year, according to President Chester J. Wleklinski.

The alternative of going with a service bureau would cost somewhere between $90,000 and $100,000 each year while "we were spending considerably more than that amount for the 370," he added.

"What really sold us on the system is the fact we can do general ledger at the same time we are writing transactions for customers," Augustine continued. "All the bookkeeping is done so we don't really need

(Continued on Page 56)

Telefile Disk Subsystem Gives HP 3000 Users More Capacity

IRVINE, Calif. — Telefile Computer Products, Inc. has a disk subsystem that allows users to add up to 1.2G bytes of disk storage to each selector channel port of a Hewlett-Packard Co. 3000 minicomputer.

A maximum Matchmaker configuration can support about 10G bytes, the firm claimed.

The subsystem uses 300M-byte IBM 3330-type disk drives. An I/O handler maps the drive so "the change is totally transparent to an HP 3000 system operating under Multi-programming Executive II," according to a spokesman.

A data management algorithm locates data on the disk without use of indexes.

A stand-alone diagnostic software package for the controller and drives is also supplied with the system.

The controller enables multisector operations across head and cylinder boundaries to take advantage of a 1.209M-byte/sec transfer rate, the firm claimed.

The controller also supports HP's auto power fail/restart, Image-Query data base management system, reload from tape routines and other HP utilities.

System hardware includes the rack-mounted Matchmaker and an interface module that fits inside the processor or I/O expansion chassis, the firm said.

A single drive with the controller costs less than $30,000 while an additional 300M-byte drive costs less than $18,000, Telefile said from 17131 Daimler St., Irvine, Calif. 92714.

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Mini System Expedites Physician Referral Requests

By Esther Surden
Of the CW Staff

SEATTLE — Where do you turn when you are a visitor in a strange city and you need a doctor who, for example, specializes in cardiology and speaks Spanish?

In Seattle, you turn to the King County Medical Society which, with the help of a small business system, can refer you to a physician who most nearly matches your requirements — and can give you a choice if there's more than one available.

The society gets more than 125 referral requests daily and keeps tabs on the specialties, ages, degrees and preferences of the over 2,200 physician members it serves, according to Robert T. Blough, executive director of the society.

For example, some of the doctors may be professors or researchers who do not take patients. Although information on these doctors is kept in the small system's data bank, no patients are referred to them, Blough explained.

The system used by the organization is an IBM 32 with 24K of memory and 13M bytes of disk.

"The main reason we chose the IBM system was its conversational ability," Blough said.

"There is a Data File Utility which allows you to access files in a combination of ways, so a secretary can respond to a question that has not been directly programmed."

Price was another reason the medical society chose the system, he added. "We are a small operation and we could not justify a larger system."

In-House Programming Development

Programs for the system were wholly developed in-house by programmer Lynda Shepard, Blough said.

First, the society did an inventory of the office procedures to find out what could be adapted to the computer. They came up with a list of about 40 applications that could be performed on the small system and then prioritized them.

Next, a data base was created on each member including the board certification, date of birth, date of graduation from medical school, name of school attended, licensing information and languages spoken — a backgrounder that includes responses to the kinds of questions patients are likely to ask.

For example, Blough noted, some people like to know the doctor's age or if he works in a group practice, so that information is included.

If the person who wanted a cardiologist who spoke Spanish called in from Seattle's downtown district, the data base would be searched by Zip Code and the information on those doctors who fit the bill would appear on the system's console.

After that particular doctor has been referred, his name goes to the back of the file to ensure impartiality, Blough explained.

Each caller is given two or three references unless the prospective patient is having trouble understanding the instructions, in which case the referral is limited to one name, he said.

Annual Directory

The system also aids in the preparation of an annual directory, provides cross-indexed lists of members within a given Zip Code area as well as those in neighboring Zip Code areas and produces management reports and budgetary projections.

It is also used to research doctors' training, specializations and memberships, Blough indicated.

"In many cases we are obtaining statistical summaries based on our entire membership instead of relying on data from sample populations," he added.

"All our information is kept confidential and is used only in response to requests within guidelines authorized by our board of trustees," he said.

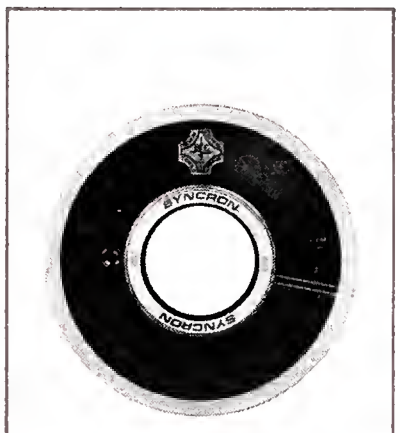
The programs at the society are based on a pattern developed by the American Medical Association called the American Medical Computer Assistance Program, Blough indicated.

The King County society is now selling its software to other medical organizations to use on the IBM 32. The complete package costs $15,000, but the organizations can purchase modules of it to suit their needs, he said.

The medical society justified the system on "the $3,000 per year we're paying for outside DP services and the alternative costs of finding, hiring and training additional staff to handle" the referral request workload. Blough said societies with 400 or more members could justify the system cost.

Originally, the system that was installed in September 1976 at the society had 32K of memory, a 9.3-M char. disk file and a 100 line/min printer.

Both the memory and the disk capacity have since been upgraded, he added.



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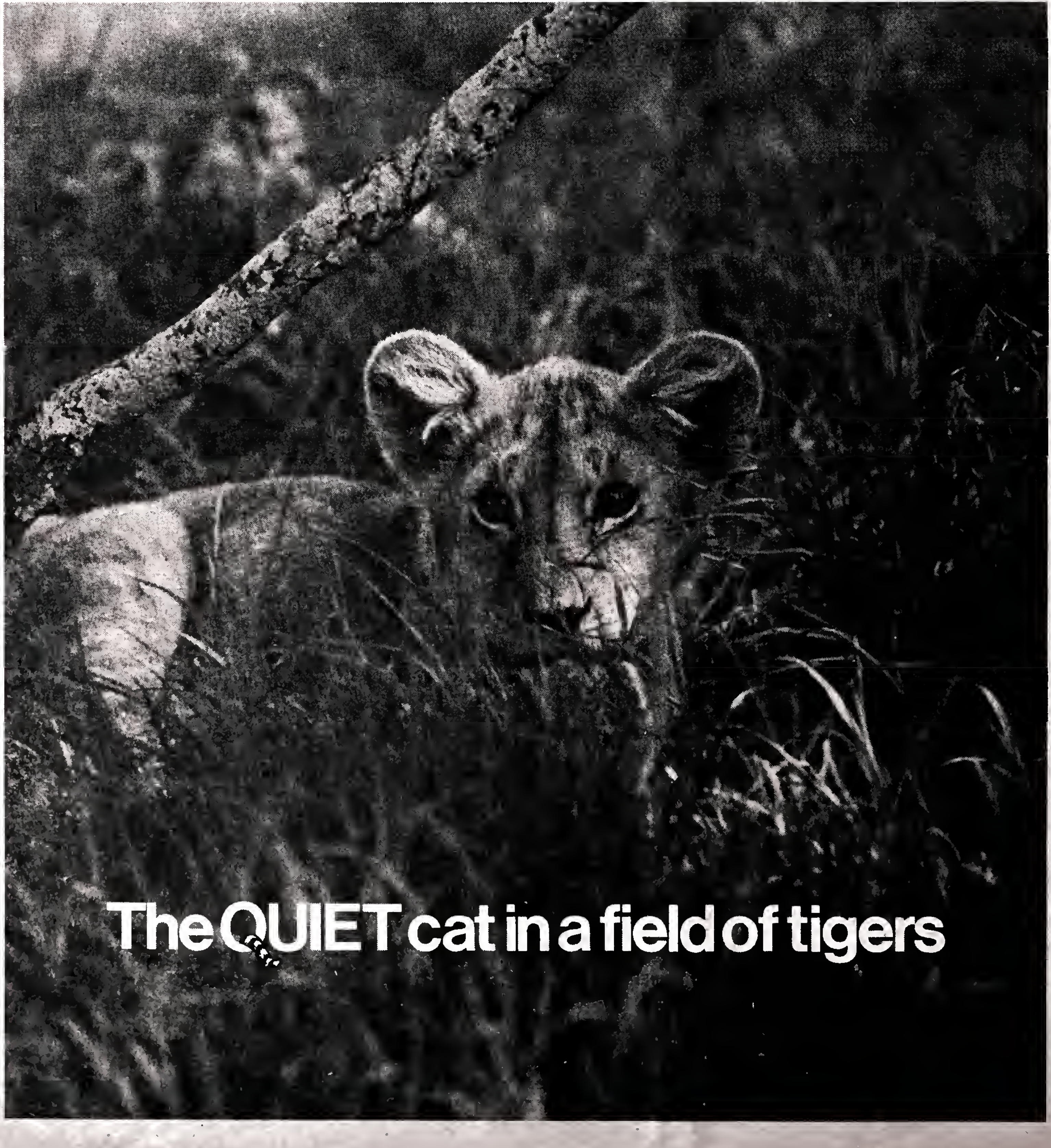

Turnkey System Aids Small Wholesalers

NEW YORK — Olivetti Corp. of America has a minicomputer turnkey system designed for the small- and medium-sized wholesaler.

The Wholesaler's Management System uses Olivetti's accounting-inventory-management report software program, which can be customized to individual users' requirements without customer programming, the vendor said.

The system was designed to provide the user information as a byproduct of billing, a spokesman indicated. Sales analysis by product, customer and salesman are available on request as are inventory stock status, valuation, price lists and reorder reports.

The hardware features multiforms handling so wholesalers can use ledger card records. Ledger cards can be eliminated, however, since all data is also stored on dual floppy disk drives, the spokesman said. With the forms handling capability, several documents can be processed simultaneously, he added.

The A6 general-purpose system on which the system is based has 20K of read-only and random-access memory and can support up to four I/O devices through a standard I/O channel. Devices such as high-speed printers, cassette tape units, paper tape readers and punches can be interfaced, the firm stated.

The turnkey system comes complete with a printer and ranges in price from $17,500 to $24,500. A typical system with 20K bytes of memory, dual floppy drive, auxiliary printer running at 100 char./sec, sprocket-feed forms handler, automatic front feed and software costs $22,000.

Olivetti can be reached at 500 Park Ave., New York, N.Y. 10022.

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Minicomputers Gaining Wider Acceptance

By Ann Dooley
Of the CW Staff

NEW YORK — Minicomputers are becoming more common to small users and non-DP shops, and mini manufacturers will have to respond by becoming more user-oriented, according to Len Farano, executive vice-president of Gambit Management Strategies, Inc.

Speaking at a Computer Caravan session recently, Farano outlined some trends he sees coming in the next few years.

"Stand-alone minis are going to be a super marketplace," he said. Those who could never afford computers before are going into minicomputers, he noted.

Minis are not really different from other kinds of computers, he stated. The main difference is in use and cost to the user.

The mini can distribute power to lower levels of usage than was previously possible. It starts to represent a means of connecting the user to information more easily and more quickly than ever before. "And this should be the prime purpose of the minicomputer," Farano said.

Stand-alone minis will be used most often by the first-time user while distributed DP systems should be used by a larger user or by a company that already has some kind of DP experience.

Distributed DP can be used by a large user trying to unload his system to do front-end work. Or, it can be used without communications by someone who has centralization, but doesn't need all parts of the system to communicate, he explained.

Micros to Replace Minis

Farano forecast that micros will be doing some of the tasks which are even now being assigned to minicomputers. "There are many repetitive tasks that don't need all that power and can be done this way," he stated.

In addition, micros cost even less than minis because they don't have all those peripherals hanging on them, he said.

"A day could be spent on refining the differences between a mini-mini, a midi-mini and a mega-mini," but the mini-minis, which usually have from one to four terminals, are being replaced by the micros," he said.

Keep Minis Small

Users are causing dangerous trends in the sizing of the different minis, according to Farano. Those users who are disappointed with their mainframes are forcing minis to become larger by adding more memory, data base and Cobol,

"But if there's a secret to minis," Farano warned, "it's to keep them small."

Instead of adding "extras" on to minicomputers, the best thing is to just add on more memory. "It's cheap and you can add a lot," he pointed out.

Farano predicted operating systems' software will be getting larger. Another major change will be that compatibility and modularity will occur so one program can be used on several kinds of systems; he said.

Application programs will be the province of the user, Farano claimed. Most applications need custom tailoring anyway, and the user knows better than anyone what his needs are, Farano said.

This is especially true since many mini manufacturers still turn the systems over to the user "from the back of a slow-moving truck," he said.

Len Farano

Applications should eventually be made according to each industry's individual needs, anyway. Right now the unsophisticated user has a large problem unless he goes to a turnkey system, he said.

Companies should invest in techniques for training programmers, he siad. They can't expect to go from a turnkey system without having anymore background than is now provided, he said.

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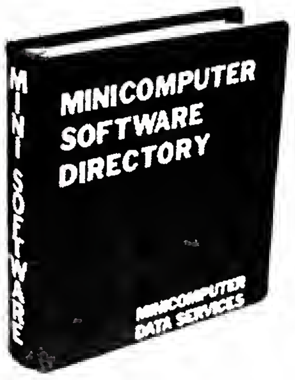

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Aids Design, Development

Mini Helps Control Engine Test Beds

SHOREHAM, England — A minicomputer at Ricardo Consulting Engineers of Shoreham, Sussex, is being used to assist in the design and development of prototype engines and will later be connected on-line to engine test beds.

Ricardo is one of the world's leading firms of experts in engine design.

The firm's engineers have been using computers for 10 years, but until the installation of the Data General Corp. Eclipse, all work was carried out on rented machines, according to M.L. Monaghan, DP director.

This was done chiefly through time-sharing services with some use of remote batch processing, he added.

Apart from the increasing cost of time-sharing, the firm eventually found it was approaching the limit of the capabilities of time-sharing systems.

In particular, turnaround time was considered excessive, and availability of machine time, particularly for large jobs, was restricted, as was file capacity, Monaghan said.

Rather than reprogram all existing work for a more powerful time-sharing service, Monaghan decided to examine the possibility of acquiring an in-house computer.

The eventual choice of an Eclipse turned out to cost little more than existing time-sharing services, while offering room for expansion of the firm's DP facilities, Monaghan indicated.

Computing at Ricardo consists of three broad types: data reduction, design automation and simulation, accounting for about 40%, 15% and 20% of system time respectively. The remaining time is taken up by program development.

Among other requirements for handling and developing this work in-house, Ricardo specified:

- The ability to work in a semiinteractive mode on design and simulation programs.
- The ability to communicate with large machines where necessary.
- Facilities for graphic output and the use of visual displays.
- Real-time multiprogramming facilities to allow process control applications and to ensure efficient use of peripherals.

A number of software features contributed to making the Eclipse Ricardo's final choice, Monaghan indicated. In particular, the operating system involved relatively low overhead compared with other systems, he said.

The mini is now running 95% of the existing computing load.

The present configuration consists of the Eclipse S/200 processor with 48K words of memory, a 5M-byte disk drive, paper-tape reader and punch, plotter, 300 line/min printer and teletypewriter.

Small Business System Fits Shirt Firm to a 'T'

HONOLULU — A small business system user here is finding his batch-oriented system fits his business to a "T".

That's the opinion of Radford Small, vice-president of Poly-Tees, a manufacturer of novelty T-shirts.

"With more than 1,300 customers for thousands of different T-shirt designs, colors and sizes we learned that a computer of our own was much more efficient and productive than trying to keep accounts by hand," Small said.

After installing an IBM 32 last fall, Poly-Tees began keeping billing and inventory information on more than 700 items, a dozen different sizes, long- and short-sleeved shirts and tie-dyed, silk-screened, air brushed or blank shirts.

"Before we had the computer, four clerks spent full time pricing and preparing bills," Small said.

"Now, we have three clerks and they are free for more productive work. Our customers' bills are produced quickly."

In addition to the inventory and billing functions, the system also uses data entered for those functions to product management reports — profitability analysis and sales analysis.

"Having all our business information in computer-usable form permits us to determine which items are beginning to take off in terms of demand, which are peaking out and which ones ought to be discontinued," Small explained.

"In a business growing 75% per year, now grossing more than $3 million per year, the more control and also the more accuracy we can provide, the better able we will be to respond to the constantly changing tastes of the men, women and children who are the ultimate customers for our shirts," he stated.

Small said Poly-Tees also markets a line of specialty perfumes which it packages and a broad range of imported goods.

The firm has a built-in bank factoring function in the system which provides the billing, inventory control and sales analysis functions for those segments of the business, he added.

When '911' Calls Come In

Mini-Controlled Net Speeds Responses to Emergencies

CHICAGO — Getting the right person to an emergency of any nature is the goal of a "911" fire, police and ambulance system using minicomputers implemented recently by the City of Chicago.

Designed by Illinois Bell Telephone, the system ties the city's telephone circuits to a network of minicomputers.

The result has been faster response by emergency vehicles, according to William L. Miller, assistant deputy superintendent at the police department.

"Prior to the minicomputer-controlled system, we had a separate emergency phone number for police and fire. Now a call is routed into a console that has control of the related geographical area. If it's a fire call, a button is pressed and the call is routed to the appropriate fire station," Miller explained.

System's Limitations

The old emergency system had to be tied to the existing telephone exchange, which determined the old geographic boundaries of the Chicago police districts. "Being restricted to exchange areas sometimes hindered response efforts," according to Jack Chapman, a spokesman for Illinois Bell.

"For example, one exchange is divided by a river, and emergency vehicles on one side had difficulty reaching the other side rapidly — there were only two bridges.

"With the routing, the districts are no longer divided this way. By keying calls to police districts, such delays do not occur," Chapman said.

"We told Illinois Bell that we wanted a '911' number and it said it could do it for $5 million to $6 million," Miller added. "So the mayor wrote it a letter and said if it could do it for that to go ahead."

The police department specified what it wanted the system to do.

Routing of Calls

When a call comes in to a particular console, the dispatcher is shown the phone number and address of the calling party, whether it is a coin-operated phone or a phone outside of Chicago, whether it is north, south, east or west, the fire alarm office and police zone from which the call comes.

"As a call comes in, it's passed off to the computer at police headquarters, which sends the number back to be verified in the Bell data base. The police and fire zone numbers as well as the address are passed back to police headquarters and routed to the proper dispatcher for the police zone," Champman noted.

Call Volume

Currently the city has a yearly average of 5.5 million emergency calls, 80% of which are 911 calls. The system, which went online March 31, handles only the 911 calls.

The minicomputer network in use has four Digital Equipment Corp. PDP-11/40 and four PDP-11/10 minicomputers with a file of Chicago's 1.6 million telephone numbers and their locations.

The customer information remains under the control of the telephone company, Chapman emphasized, and is displayed only when a caller has dialed 911.

The system was developed as the primary handler of 911 calls, Chapman explained, but the basic telephone net serves as a backup. If the mini-controlled system does not respond to an incoming call in two rings or less — because of malfunction or a heavy load — the regular network responds.

Independent Consultant Can Help Reduce Uncertainty, Users Told

NEWINGTON, Conn. — Small business people looking for their first systems should realize consultants don't know all the answers — but they can help, according to an article in the spring 1977 "Small Business Computor" newsletter.

Users hire consultants to reduce their uncertainty in areas in which they are not expert, the article said. "Time and money savings, or both, should result.

"The computing industry, per se, is one of the few remaining unregulated industries in the U.S.," the article warned, and as a result "the typical small business executive is easily and readily confused by the claims and counterclaims made by marketing personnel.

"The role of the independent computer consultant is to analyze these claims in relation to specific needs and provide a problem solution. Such a solution may not utilize a computer or computer service.

"Computers and computing services are business investments and should be analyzed as such," the article continued.

Two-Phase Approach

A two-phase approach is recommended, the newsletter said. First, the consultant should create a requirements document describing what a successful solution will provide. "This first phase should also produce a gross schedule and cost estimate," and all practical alternatives should be considered.

Phase 2 implements one of the alternatives in Phase 1 but, the article warned, "you should never feel obligated to implement a suggested solution."

Word of mouth is probably the best way to find a consultant; after that several associations are available to provide names.

A consultant should never be hired solely because of low fees. Users should make sure the consultant "knows what he's talking about." A detailed planning phase should be suggested and the consultant should want to involve all levels of personnel with the proposed plan.

When the user asks questions, "make sure you understand the replies. Don't accept 'computerese' or technical jargon. They're usually a coverup," the article continued.

The user should also make sure the consultant doesn't have "underlying motives. If the fee is based solely on work performed, fine. If there's a commission involved, if he's selling 'iron' (computers) or a service, beware."

Insist on Documentation

The newsletter urged users to insist on documentation so others could pick up the pieces with minimal effort.

"A truly professional consultant will not tie his fee to specific results. He knows there are many factors outside his sphere of influence."

However, the user should evaluate savings from the computer, increased management information and documentation.

"Did he assist in the implementation of the solution? Or did he make you or your business heavily dependent on additional, expensive consultation? If the consultant failed in one or more of the above, tell him," the article said.

"Small Business Computor" is published by SEI Publications, a division of software Engineering, Inc., at P.O. Box 145, Newington, Conn. 06111.

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System Links to 15 Lab Tools

MAYNARD, Mass. — The Declab 11/03 IB from Digital Equipment Corp. reportedly allows up to 15 industry-standard laboratory devices to be attached to it.

Based on DEC's PDP-11/03 microcomputer and an instrument bus conforming to IEEE Standard 488-1975, the system permits integration of laboratory instruments with a system designed to support scientific analyses, DEC said.

Fortran IV

The system uses Fortran IV to effect communications to and from the various instruments connected to it, DEC said. It operates under DEC's RT-11 operating system with a scientific subroutine package for analyses of data from instruments through user-developed software handlers, the firm said.

Two Declab-11/03 versions are available. One has an LA36 teleprinter as system console, a floppy disk and a CPU enclosed in a small cabinet that can be rolled from place to place. The second uses a VT55 graphics terminal as its console.

Optional interfaces including analog-to-digital and digital-to-analog converters, parallel digital input and output interfaces and a programmable real-time clock are available, DEC said.

The Declab-11/03 1B with the teleprinter costs $14,000 while the version with the graphics terminal costs $15,000, DEC said from Maynard, Mass. 01754.

Able Has PDP-11 Bus Repeater

SANTA ANA, Calif. — The Model 10014 Re-bus from Able Technology here performs the function of a bus repeater for Digital Equipment Corp. PDP-11 minicomputers.

The Re-bus allows users to add more peripherals to their PDP-11s than can be handled with the Unibus, Able said.

A functional replacement for DEC's DB-11A bus repeater, the unit is mounted on a dual-width board and installs in the same pair of connecters as a Unibus extension cable. The extension cable then plugs directly into connectors in the Re-bus.

The unit is said to take up less room than the DEC unit and to operate somewhat faster than its DEC counterpart. It can be used individually or in whatever multiples the application requires; each unit allows for 19 additional bus loads as well as 50 additional feet of bus length, a spokesman said.

The unit costs $1,400, the firm said from 1616 S. Lyon St., Santa Ana, Calif. 92705.

S&L's Conversion to Mini Proves Cost-Effective

(Continued from Page 51)

a bookkeeper.

"When a person comes in and deposits a check, all the necessary updates and balance increases are taken care of and the same with a withdrawal. There is no further work to be done," he said.

"Before, we had to go back to the bookkeeper and duplicate operations," he noted.

Customers can walk into any of First Federal's five offices and update an account, Augustine said. IBM terminals at teller's windows are used.

Savings certificates are similarly handled, but the system also carries the maturity date, dollar amount and current earnings tally. Maturity notices are generated through the CPU weekly.

On Demand Deposit Accounts — accounts from which customers may withdraw at any time — the system produces statements with a detailed breakdown of the postings. These statements can be mailed monthly or quarterly as the customer selects, he said.

A mortgage system on the IBM 3 is a standard package supplied by First Federal's subsidiary Metiri-Data, Inc., as was all of the software. The savings and loan has modified this package for its own needs, which Augustine said is easy to do with the RPG language.

The Metiri-Data packaged systems are available to other savings and loans, he added.

Another function the system fulfills is generation of off-line reports. "Before it was a cumbersome project in the language we were working in to produce the reports," Augustine said.

Reports such as mortgage loan affidavits which have to be mailed to the county to qualify the mortgagee for a tax exemption on real estate taxes had to be produced manually — all 5,000 of them, he said. "This is the first year we've been able to do it with our own system," he noted.

The 128K 3/15 has two 3340 disk drives for a total of 120M bytes of disk and a 3741 for diskette data entry. A 1403 printer is also part of the system.

First Federal is using IBM 2980 terminals, but "the system can run anybody's terminal," according to a spokesman for Metiri-Data.

The system is "completely unattended" and is located next to the accounting area. Programs are loaded at the beginning of the day and the system just runs, he added.

CA Announces Family Of Naked Mini-4s

(Continued from Page 51)

tems, is also available.

CA also has a disk-based operating system that operates under Macro, Fortran IV, Basic and CA's Pascal language.

The operating system executes in configurations with floppy, medium- or high-capacity disk drives in as little as 16K words of memory, the spokesman said.

A multitasking real-time executive, also available, handles real-time overhead functions and services. An I/O executive, a communications executive and a file manager operate as subsystems under the RTX, CA said.

A packaged LSI 4/10 including chassis, operator's console and power supply costs $995. The 4/30 with 16K words of memory, chassis, power supply and console costs $3,495. The 4/90 with 64K words of 550 nsec RAM, operator's console and power supply costs $9,950.

CA is located at 18651 Von Karman, Irvine, Calif. 92713.

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CCIA Testimony Indicates

Congressional Overhaul of Antitrust Statutes Needed

By Edith Holmes
Of the CW Staff

WASHINGTON, D.C. — Congress should institute action to produce a basic overhaul of U.S. antitrust statutes, according to Timothy C. Cronin, chairman of the board and chief executive officer of Inforex, Inc.

Speaking before the Senate Subcommittee on Antitrust and Monopoly during its oversight hearings here recently, Cronin suggested "the effect upon the public is the same whether a company intended to become a monopolist or not."

Intent, he maintained, is irrelevant to the effect IBM has on the computer industry or the harm AT&T causes the communications field in the areas of technological innovation and the ability of smaller firms to attract capital.

The removal of the Sherman Act Section 2 provision that makes proof of intent a prerequisite to proving monopolization of an industry is also "the single most critical factor in expediting monopoly cases," Cronin added.

'A Dramatic Example'

The Inforex executive, who appeared on behalf of the Computer & Communications Industry Association (CCIA) before the Senate subcommittee, cited the government's antitrust case against IBM as "a dramatic example of what is wrong in antitrust enforcement.

"The modern-day monopolist can redefine markets, cross-subsidize products, create artificial technological barriers to entry, discourage Wall Street investment in competitive new ventures and, if challenged, overwhelm the government or private plaintiff with legions of antitrust attorneys well schooled in the tactics of delay," Cronin said.

"The small businesses competing in these monopolized industries are left no real option but to watch it all patiently until it is their turn to be forced under," he added.

Cronin considers his own company, which produces data entry systems, terminals, file management systems and systems for distributive DP, to be in direct and indirect competition with both IBM and AT&T.

Asked by subcommittee chairman Sen. Edward M. Kennedy (D-Mass.) what his company offers to the American consumer that IBM and AT&T do not, Cronin contended his firm has introduced minicomputer-based products which the computer industry leader, in particular, chooses not to bring out.

IBM found its older, depreciated punch card and keypunch equipment sufficiently profitable that it left the problems of data entry to companies like Inforex, Cronin suggested.

"Most of the innovations in our industry have come from companies such as Inforex and not from the very large mainframe companies," he contended.

Vigorous Pursuits

Setting aside the issue of "intending to monopolize" and assuming that "IBM executives are interested in statesman-like conduct and try to be very responsible," Cronin said he believes the corporation and its management "approach the marketplace just as vigorously as they've approached the legal case."

They do "all they can within the law that has the consequence of overpowering and harming the innovation component of the business," he added.

Many practices that have emerged from "IBM's orderly pursuit of its business" have also greatly restricted the ability of Inforex and other small companies to obtain capital, Cronin stated.

One major capital barrier to entry in the computer industry is the fact it is based on the rental or lease of equipment to customers, he said.

"There is no technological, consumer or operational reason why it needs to be a rental or lease business. It's been a tradition in the business; it's been a case where you follow the leader," Cronin noted.

'Artificially Cash Intensive'

IBM has always maintained the industry should be a lease or rental business because this practice maximizes return on investment as the equipment begins to depreciate and it raises the threshold for new competitors to enter the industry, he stated.

As a result, the computer business "is artifically cash intensive," Cronin said.

Added to this fact is IBM's large stockpile of cash of its own, the Inforex executive noted. IBM has $6.156 billion, according to recent *Forbes* magazine figures. "The rest of us have to borrow money," Cronin told the senators.

IBM's cash advantage, coupled with the threat that hangs over the industry as to what IBM will do next, serves as a deterrent to the capital/financial structure that has money to lend, he said.

Removing the need to prove that a company deliberately sets out to monopolize an industry is but the first step Cronin recommended Congress take in a "basic legislative overhaul of the nation's antitrust statutes."

"What many of us consider to be the most inexcusable of the problems surrounding antitrust enforcement in large cases are the built-in incentives to delay," he said, noting IBM makes another $6.5 million each day the government's case against it drags on."

"If the court finds the defendant delayed the proceeding" these fines would "clearly expedite monopoly cases," he suggested.

The tax laws should also be amended to deny all deductions for damage awards and costs of defending a suit where the defendant is found guilty, Cronin said.

Enforcement Improvements

Antitrust enforcement could be improved, Cronin said, through legislation mandating the expedition of large cases; legislation facilitating the use of special masters by trial judges to assist them with complex cases; and legislation permitting private enforcement of antitrust judgments and creating civil penalties for violations of such judgments.

Legislation enabling the Justice Department to employ outside counsel and providing government funding for such use and legislation requiring counterclaims to be severed from antitrust charges in Private Sherman Act Section 2 cases would also improve enforcement.

The Inforex executive urged Congress to encourage the Justice Department to appoint an experienced trial lawyer to head the Antitrust Division, to increase salaries for the trial staff, to press for increased resources in funding attorneys and paralegals and to hire outside attorneys for various phases of complex litigation.

Cronin also stressed the importance of an open show of support for structural cases by the Attorney General.

IBM Shifting Large Systems' Strategy From Lease to Purchase Base: Analyst

By Toni Wiseman
Of the CW Staff

NEW YORK — Competitive and technological pressures have induced the structural pricing shifts that reflect IBM's changing strategy, according to an analysis by Kidder, Peabody & Co., Inc., a brokerage house here.

"IBM and the mainframe computer industry, in our view, are currently at a major turning point, as the recent aggressive price cuts by IBM and other manufacturers indicate," the report stated.

"Strengthening competitive forces — primarily a reduction in the extent to which hardware manufacture is proprietary, encroachments by minicomputer and plug-compatible-equipment companies and increasing overlap of products and product use — are reducing the traditional profit leverage achievable in the computer hardware system business.

"These competitive trends, coupled with a rapid pace of technological development that shows no signs of slackening, are reducing the viability of the rental-base concept," Kidder, Peabody stated.

Trend Prediction

Kidder, Peabody predicted a trend away from a rental-based market to outright sales.

Based on the ability of independent companies to duplicate IBM and other manufacturers' equipment, to take advantage of new, cost-saving technologies and to live with lower profit margins than IBM, thus improving their chances of displacing IBM gear before complete depreciation.

"By drastically accelerating the rate of unbundling, IBM and others will attempt to offset the reduction in hardware profit leverage that the increasing competition has induced," the report indicated.

The brokerage firm also envisions significant, additional charges for software and support as well as for service and maintenance. "It is anticipated that fees for operating system software, for applications programs (possibly in microcode) and for all support functions will constitute an increasing proportion of IBM revenues over the longer

(Continued on Page 59)

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Infonet Proving Strongest Contributor to CSC Net

By Toni Wiseman
Of the CW Staff

EL SEGUNDO, Calif. — Computer Sciences Corp. (CSC) is a company programmed for growth and a primary part of its coding is Infonet, CSC's services arm.

Founded in 1970, Infonet today provides time-sharing services to some 3,000 users via remote terminals linked to data centers in Chicago and Los Angeles. The network functions over leased satellite circuits and a 140,000-mile network of leased land lines..

A second satellite over the Atlantic relays data between the U.S. and European centers in Brussels, Frankfurt, London, Paris and Madrid.

Infonet today provides about 25% of CSC's total revenues, but accounts for about 45% of its pretax earnings, according to John W. Luke, Infonet president. Infonet pretax income was $11 million on revenues of $48.5 million in 1976.

Eager for TSP

The federal government is a large CSC customer, accounting for 63% of its revenues. Infonet currently holds roughly 20% of the available government contracts for its market segment.

However, Infonet has so far been the only firm which is controlled in terms of charges, so 80% of the federal contracts are going to uncontrolled and therefore often more expensive bids, Luke said.

As a result, Infonet "is favorably disposed" toward the General Services Administration's (GSA) Teleprocessing Services Program (TSP), he said, noting he expects no loss in market share since his firm is the incumbent and will be able to compete favorably in terms of costs.

Government contracts represent about 60% of Infonet's revenues, slightly more than the public sector, Luke said, but the firm continues to place a great deal of emphasis on the commercial area, particularly on multinational services such as financial consolidation.

Integrated Network

Infonet views the full integration of its system as one of the network's primary strengths — the same services are available in all countries through the same network with a single dial-in to a common concentrator.

Infonet even has a Telex interface, so the services are available virtually worldwide, Luke said.

Infonet customers use the network's Univac 1108s for planning, analysis and engineering programs among other applications, using CSC-provided software on their own.

Luke noted the majority of Infonet use is not overload or development work, but rather production work complementary to an in-house machine.

Luke sees the problem facing Infonet as much the same one facing McDonald's: Should it add something besides hamburgers or should it go outside the country for more markets?

A unique facet of Infonet is its pricing schedule, designed to give the user the flexibility he needs at the lowest price.

The schedule offers four different levels of contracts with different price capabilities, benefits and obligations, according to Norman W. Derrick, manager/legal, pricing.

There are four primary pricing criteria: conversational connect, CPU, batch and storage. The user evaluates his expected use of each of the four categories of services and decides which is most critical to his application or contributes most to his charges. He designates that service for the lowest price category, Derrick explained.

The user then decides which resource he will use the least and selects that as his highest category — the one for which he will pay the most — and so on for the remaining two services. The user's final profile will therefore include the four services, each weighted at only one of four possible levels.

The user must keep this pricing plan for at least 60 days, but after that he is free to change, Derrick said. This means, for instance, that the user moves from the planning and programming stage to the operational stage, he can reweight his base of resources to keep his costs as low as possible.

"We have a broad use of users so we have a good cross-section of resources usage. If we'd been very specialized in one application, for instance, we could not have implemented this pricing scheme because of the emphasis on one resource," Derrick noted.

Basic/Four Plans Printer

IRVINE, Calif.— Basic/Four Corp. plans to manufacture its own printer by the end of the year.

Designated Model 3510, the 300 line/min printer will be manufactured at the firm's Tustin, Calif., facility.

The standard printer for Basic/Four's top-of-the-line System 700, the model features a standard 96-char. upper/lower case capability and is particularly well suited for tasks where large volumes of forms and reports are required or the need for graph plotting exists, according to T.J. Smith, president.

The printer will be optional on other Basic/Four systems.

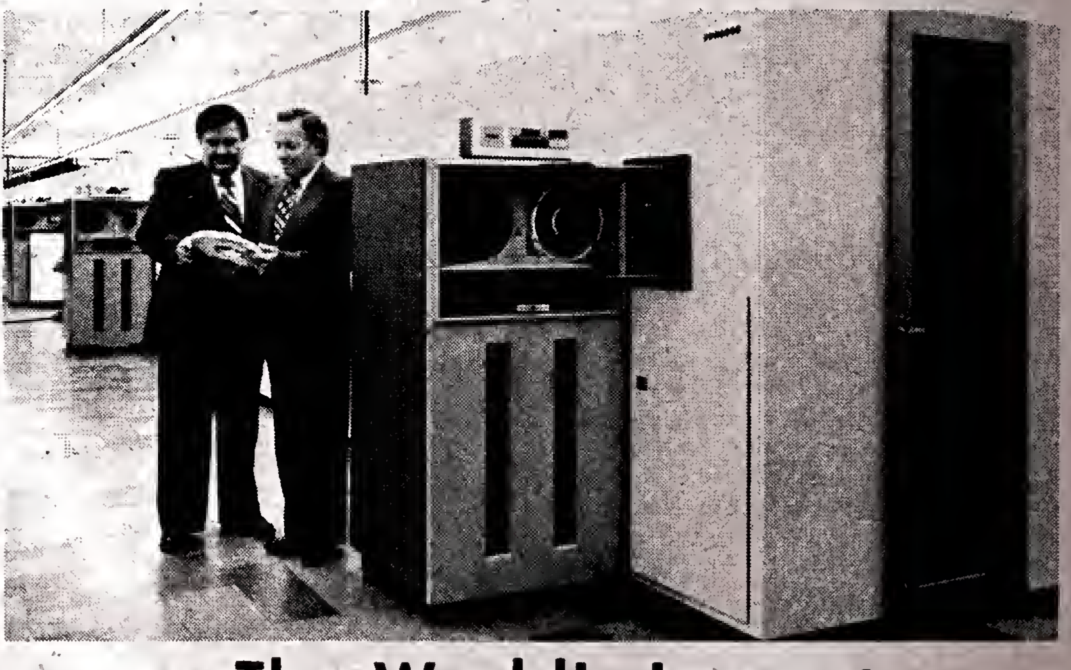
SEL, TMI End Suits

FORT LAUDERDALE, Fla. — Systems Engineering Laboratories, Inc. (SEL) and Technology Marketing, Inc. (TMI) have concluded an agreement to dismiss two lawsuits between the two companies.

Both lawsuits were filed in September 1976.

Under the agreement, SEL and TMI exchanged general and special releases, and TMI waived U.S. and foreign patent rights relating to SEL 32 series computer systems for technology previously supplied by TMI.

SEL agreed to a cash settlement to TMI of $410,000 for the general and special releases.



The World's Largest

California Computer Products, Inc. has installed what is reportedly the world's largest mass storage system. The Model 7110 automated tape library can store 1.5 trillion bytes of information on 8,351 tape reels. The system, which is nearly 100 feet long, was recently delivered to the U.S. Army DP center in St. Louis, Mo.

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Despite IBM Impact on Mini Mart

DEC's Earnings Potential Positive: Broker

By Toni Wiseman
Of the CW Staff

NEW YORK — Even in light of IBM's potential long-term impact on the minicomputer markets, Digital Equipment Corp.'s earnings could grow at a 20% to 25% rate over the next five years, according to an analysis by L.F. Rothschild & Co. (LFR), a brokerage firm here.

"From a practical viewpoint, we believe DEC's five-year growth rate could approximate 25% to 30%, reflecting expansion of current business opportunities and exploitation of other business areas which are not yet being fully addressed," the report stated.

"The company's aggressive worldwide production expansion program continues on or ahead of schedule, despite accelerated order activity, which has added to backlog and lengthened lead times.

"Management reports no significant order defection, primarily due to the 'software lock' between DEC and its customers, but capacity constraints are losing the company opportunities," LFR noted.

DEC's worldwide order rate continues to accelerate in almost all product and application areas, with shipments of the PDP-11 family running in excess of 800 units per month.

Growth in the Datasystem series has doubled annually in the past few years, but is expected to be about 50% to 60% in 1977, reflecting the fact that sales will be constrained by capacity limitations, the analysis found.

Business minicomputer product revenues will, nonetheless, surpass the $100 million level this year, it added.

DEC's worldwide production facilities are scheduled for 50% expansion over the next 18 to 24 months, and unusually long lead times related to capacity shortages will continue until the fall, LFR noted.

The analysis approximated current equipment lead times as: PDP-8, 1 year; PDP-11 Complex Configuration, 1 year; PDP-11 Simple Configuration, 6 months; PDP-11V03, 3 months; LSI-11, on demand; and Decsystem-10/20, 6 months.

Cancellations Insignificant

"Management reports these delays have not yet caused a significant number of order cancellations, although DEC is being penalized by the resultant lost business opportunities," LFR said.

"Even if a recession occurs in [fiscal] 1979, we do not believe DEC would be saddled with an overcapacity situation. The probability of a recession in 1979 is questionable, and since DEC's current manufacturing expansion plans are geared toward longer term needs as well as current demand, we find the program a necessary and rational move.

"Our positive assessment is partly based on management's demonstrated ability to keep an aggressive expansion program on schedule, while revenues increased by 80% over the past three calendar years," LFR reported.

While some industry figures have expressed the opinion that IBM might "pirate" DEC's sales force in the giant's aggressive push for growth in the minicomputer area, LFR contended this was probably not the case due in part to DEC's stock option plan.

CDC Revamps

MINNEAPOLIS — Control Data Corp. has instituted a corporate reorganization which has resulted in the creation of a new education company and the consolidation of all computer activities into one operating group.

CDC now has three operating entities — education, computer operations and financial services.

Formerly, financial services, peripheral products, computer systems and services each operated as separate units and educational activities were segmented among these various company entities.

Robert M. Price, formerly head of computer systems, services and marketing, will serve as president of the computer group.

John W. Lacey, formerly head of corporate plans and controls, will serve as president of the education company.

Congress Should Overhaul Antitrust Statutes: Cronin

(Continued from Page 57)

term," the report said.

IBM's recent actions were seen as supportive of a long-term strategy toward outright sales and unbundling, as well as being consistent with a shorter-term strategy to achieve gains in the level of DP sales in 1977 and 1978, "albeit considerably more modest ones than in 1975 and 1976," the analysis noted.

"Our analysis of some of these recent moves has, however, caused us to reduce our earnings estimates from $18 to $17.60 in 1977 and from $20.20 to $19.70 in 1978," the firm noted.

Four-Pronged Strategy

Kidder, Peabody outlined a four-pronged strategy it believes IBM is initiating:

(1) To blunt the competitive edge of other manufacturers in various sectors.

The introduction of the Attached Processor System on the 370/168 and 158 and memory price reductions which lowered the price/performance advantages of non-IBM large systems are examples of this strategy level.

(2) To pave the way for a significant increase in charges levied for various forms of software.

The Selectable Unit (SU) concept introduced in May 1976 is a prime example in that SUs are separately developed, maintained and documented, thereby increasing the separation and potentially the price of parts of the operating system, some of which could be packaged in microcode at a later date, Kidder, Peabody noted.

(3) To provide a higher incentive for outright sales over the next one to three years.

This was exemplified by the reduction in purchase-to-rental multipliers on memory and 370/138, 148, 158 and 168 models.

(4) To provide some short-term incentive for rental in 1976 and early 1977.

Strategy Support

The reductions in Term Lease Plan prices and the increases in multipliers on new System 32 configurations are viewed as supporting this strategy.

In order to maintain steady growth and current profitability rates, IBM will have to place more emphasis on sales as opposed to rentals, the analysis indicated.

"During the past several years, we believe, a variety of competitive and technological pressures have reduced the viability of equipment rental and made it more difficult for IBM to keep lucrative residuals that follow the four-year depreciation period.

"As a result, the length of the IBM product announcement cycle, which has been approximately six years since the 1401 was introduced in the late 1950s, is tending to increase," Kidder, Peabody noted.

Announcement	Date	Possible Purpose and/or Effect
370/168: Attached Processor System introduced	February 1976	Improvement in performance/price ratio of 370/168; slight reduction of advantage of Amdahl plug-compatible CPU
Operating System: Selectable Units introduced	April/May 1976	To separately develop and maintain many versions (Selectable Units) of the operating system
Memory: prices reduced	May 1976	Improvement of performance/price ratio of several IBM systems; memory multiplier reduced from approximately 44-48 to 29; incremental System/370 memory priced at 17 cents per byte compared with 26 cents per byte previously
370/138 and 148: introduced	June 1976	Significant performance/price ratio improvement for mid-range systems, amounting to as much as 75%; system multipliers reduced from 45-to-48 range to about 36
System/32: nine new configurations introduced	June 1976	Enhancement of low end of line; slight increase in system multipliers from 34-to-37 range to 37-to-42 range
TLP: reduction of 9% in Term Lease Plan	June 1976	Disincentive for purchase and incentive for four-year lease of System/370 CPUs
System/3 and System/32: rental prices raised 5% on several systems effective 1/1/77	August 1976	Inflationary-type price increase, multiplier effectively lowered as corresponding purchase price increases were not made
Systems Network Architecture: Extended networking capabilities introduced	November 1976	Separately priced software for various facets of networking, available in mid-1978; monthly license fees substantive; a further step in the direction of separation of function and price for software
370/158: Attached Processor System introduced	November 1976	Improvement in performance/price ratio of 158; reduction of advantage of Itel and Amdahl plug-compatible CPU competitors
Series I: two minicomputer models announced	November 1976	Purchase-only minicomputers introduced as strongest entry to date of IBM in minicomputer market; limited software offered initially; fully unbundled; no quantity discounts; memory priced at 12 cents per byte
Memory: 35% price reductions on 370 MOSFET memory	March 1977	Aggressive improvement of performance/price ratio for nearly all systems, especially at the high end, where purchased 158 and 168 performance/price ratios were improved by 30% to 50%; most incremental memory priced at 9 cents to 12 cents per byte
370/158 and 168: 30% CPU purchase price reductions		
3033 Processor: introductions		
GSD Products: price reductions		
370/115, 125, 135, and 145: CPU rental and purchase price reductions of approximately 20%; purchase prices on Incremental memory for the 135 and 145 reduced approximately 35%	April 1977	To increase competitiveness of older models of System/370 and reduce incremental memory multipliers; through the System/34, provide an upgrade to System/32 and penetrate further the market for multiple-user access; through the Series/1 enhancements, penetrate the minicomputer market more aggressively; Series/1, in unit quantities, competitively priced, with most major user programming needs satisfied
System/34: introduction		
Series/1: Program language enhancements and incremental memory price reductions		

Chart prepared by Kidder, Peabody & Co.

Significant IBM Product and Pricing Announcements in 1976 and Early 1977

$9.3 Million Spent Last Year

Amdahl's 1977 R&D Budget 72% Higher Than in 1976

By Molly Upton
Of the CW Staff

SUNNYVALE, Calif. – Amdahl Corp.'s 1977 budget for research and development (R&D) is 72% above the $9.3 million expended in 1976, according to the firm's annual report.

During 1976, the firm's commitment to R&D projects was 19% above the 1975 figure and 43% greater than the average expenditures during 1971-1974 that yielded the 470V/6 technology, the firm acknowledged.

One tenth of 1976 revenues was plowed into engineering and development, Amdahl said.

One third of Amdahl's talent resources was committed to engineering activities last year. Nearly half of the engineering staff, which grew by a third during the year, was working on product enhancements, new system functions and future technologies, the report indicated.

During the year, the firm began production of a lower cost memory system for the 470V/6, according to the report.

Not all R&D was done in-house. The firm advanced $500,000 and is committed to advance $1 million this year to a manufacturer of memory systems for the development of certain memory devices, the report disclosed.

In exchange, Amdahl has received and will receive certain licenses to manufacture and market certain products if it advances a total of $3.5 million and additional licenses if it advances a total of $5 million.

Amdahl has and will receive a minority interest in the development company, the report said.

Total staff at Amdahl grew by 106% to 770 persons at the end of 1976. The largest single gain was within the field-support organization; manufacturing doubled and R&D increased by half.

The number of regional offices doubled, with a comparable increase in marketing staff, the firm indicated.

By mid-1977, the company will have 73% more square footage than was available to it at year end, the report indicated.

Production capacity also increased. Toward the end of the year, Amdahl had the capacity to ship up to four systems a month. During the year the firm shipped 27 systems compared with six in 1975. Increased installations brought more efficient deployment of field support staff and spare parts, Amdahl said.

Return on revenues grew from 4.7% the first quarter to 16% in the fourth, for an average of 12.6% for the year, the firm stated.

Gross margin increased to 47.7% while operating expenses increased $5.9 million – 49% – from 1975 to 1976. Net interest expense remained about the same and was $2.3 million.

Agreements With Fujitsu

The firm had no long-term debt as of year-end 1976, but it does have several agreements with Fujitsu Ltd., a principal stockholder, according to the report.

Amdahl is required to purchase, and Fujitsu to deliver, subassemblies for a minimum of 27 systems between Dec. 31, 1976 and July 31, 1979.

If Amdahl fails to purchase the minimum number, Fujitsu may become licensed under certain of Amdahl's U.S. patents which would permit Fujitsu to sell complete systems in the U.S. to make up the difference between what Amdahl had sold and the minimum promised.

Fujitsu's secured interest equal to the unpaid balance on subassemblies and spares sold to Amdahl as of Dec. 31 was about $20.6 million.

The 1976 cost of revenues for equipment sales includes the cost of subassemblies purchased from Fujitsu of nearly $39 million during 1976, the report indicated.

The agreement between Amdahl and Fujitsu also grants the Japanese firm nontransferable, nonexclusive, royalty-free licenses for the use of certain patents in return for financial and other support in the firm's development stages.

Furthermore, the firms have formed a jointly owned company – Amdahl International Ltd. – to develop, manufacture, sell and service computer products under patent licenses from the two firms covering all areas of the world except the U.S., Canada, Japan and Spain.

Fujitsu has also backed up certain of Amdahl's sales. In two instances, it guaranteed a portion of the customers' installment contracts in return for a total of $100,000, the report said.

How to love DEC without marrying the whole family.

The PDP-11 is a real beauty. The CPU, that is. It's too bad we can't say the same for the peripheral members of the family. Especially the line printer. To us, it costs way too much, and it's hung-up on outdated technology.

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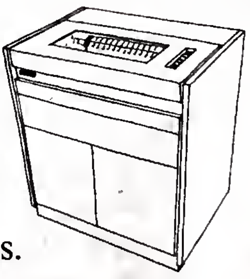

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Chip Makers Showing Expanded System Repertoire

Chip makers seem to be offering an increasing number of products aimed directly at the OEM. These chips perform specific functions and replace larger logic formations.

Signetics, Inc. has announced a programmable LSI chip said to format, receive and transmit serial digital data in Synchronous Data Link Control (SDLC) and all other synchronous data communications protocols.

The Model 2652 multiprotocol communications controller operates at data rates up to 500,000 bit/sec from a +5V power supply.

It supports bit-oriented protocols such as SDLC, HDLC and ADCCP and byte-oriented protocols such as BSC and DDCMP, the firm said.

Both receiver and transmitter sections are double-buffered and operate in either half- or full-duplex modes.

The chip can be interfaced with an 8- or 16-bit data bus.

The 2652 costs under $30 in quantities over 100; sample quantities are available now and full production is expected by mid-year. Signetics is at 811 E. Arques Ave., Sunnyvale, Calif. 94086.

Ascii Generator

Texas Instruments, Inc. has an MOS Ascii character set generator which is organized as a 1K-word by 8-bit read-only memory in a 24-pin plastic or ceramic package.

The TMS4710 generator outputs information for a full set of upper/lower case Ascii characters.

Maximum access time and minimum cycle time are 450 nsec each.

OEM Products

The prices in 100-piece lots are $12.66 for the ceramic and $10.66 for the plastic. TI can be reached through Inquiry Answering Service, P.O. Box 1443, M/S 669 (Attn: TMS4710), Houston, Texas 77001.

Litronix is offering an alphanumeric LED display with intelligence that interfaces like a random-access memory chip.

The DL-1416 display is fully buffered and has a built-in Ascii decoder, multiplexer, memory and LED drives, thus making the cost per character $5.50 or $22 for a four-character module in lots of 1,000.

The characters are .16-in. high and the DL-1416 module, which is 1- by 1.2 in., displays four characters.

Litronix is at 19000 Homestead Road, Cupertino, Calif. 95014.

Dual-Processor Modules Use 'Nonstop' Architecture

CUPERTINO, Calif. — Tandem Computers, Inc. has introduced two multiprocessor system modules designed specifically for OEMs and system houses.

The Tandem T16/210 and the T16/240 multiprocessors use the architecture of the Tandem 16 Nonstop system.

Included with the system modules are Guardian, Tandem's multiprocessing, multiprogramming operating system, and T/TAL, a high level language for applications and systems development.

To meet OEM needs, the T16/210 (core memory) and T16/240 (semiconductor) systems can be assembled modularly, the firm said.

The system modules consist of 22-slot card cages capable of supporting two T16 processors with up to 320K bytes of semiconductor memory or 128K bytes of core memory.

Tandem's dual interprocessor Dynabus, processor boards, memory boards, I/O channels, cooling fans and power supply are included. Up to eight device controllers can be installed in the system.

The price of the system module is $39,500 and includes two processors with 64K bytes each, power fail arrest, memory map protection, bootstrap loader, direct memory access, interval timer, 122 instructions, block multiplexed I/O and power supply.

The semiconductor version costs $41,500, including the battery backup.

The power module costs $900 and the rack module $1,050 from the firm at 20605 Valley Green Drive, Cupertino, Calif. 95014.

Infomag Has Read/Write Head To Handle IBM 3350-Type Media

GOLETA, Calif. — Information Magnetics, Inc.'s (Infomag) Model 6350 disk drive head was designed to handle IBM 3350-type media, according to the firm.

The head, designed for drives with 6,350 bit/in. and 480 track/-in. data storage, incorporates an integrated circuit module with the read/write electronics within the assembly, Infomag said.

"Having the electronics close to the head means a significant reduction in parasitic noise and capacitances," according to David A. Sutton, vice-president of engineering.

Infomag 6350

"Bit and track density can be very high," he added.

The unit was designed for disk speed of 3,600 rpm, with inner track diameter 7.98 in. and outer track 13.12 in.

Prices in lots of 5,000 are $1,250 for the fixed-head version and $1,000 for the moving-head version from 5743 Thornwood Drive, Goleta, Calif. 93017.

Three Makers Add Print Options

Dataproducts Offers Mark IV Hammers

WOODLAND HILLS, Calif. — Moving further into the OEM business, Dataproducts Corp. is offering not only the hammerbank of its Mark IV printer, but also the individual print hammers.

Prospective users are firms who do not require a full hammerbank of, for example, 123 print positions, a spokesman explained.

The firm will supply the hammers individually or in standard or custom hammerbanks. Each hammer is inserted with a single screw.

The basic hammer in 1,000 quantities costs $14.95 from Dataproducts at 6219 De Soto Ave., Woodland Hills, Calif. 91364.

POS Device Out

NEW YORK — C. Itoh Electronics, Inc. is marketing the Model 7022T dot matrix printer designed for label applications and use in point-of-sale (POS) types of devices.

The 22-column dot matrix printer features character positioning determined by an electronic clock, which helps reduce the electronics, according to the firm.

Features include 12 char./in., 1.58 line/sec, top-of-form sensor option and the ability to accept multicopy forms up to .015-in. thick, according to the firm.

The price is between $175 and $190 per unit in lots of 100 from C. Itoh at 280 Park Ave., New York, N.Y. 10017.

CDI Unit Gets APL

BURLINGTON, Mass. — Computer Devices, Inc. (CDI) has extended the capabilities of its thermal Q-3 printer to include APL.

The Q-3 printer offers selectability to either APL or Ascii (upper/-lower case), the firm said.

The Q-3 operates at up to 30 char./sec and prints 80 char./line in a 5 by 7 dot matrix. It weighs less than 4.25 lbs. and costs under $890 in quantities of 25 or more from CDI at P.O. Box 421, Burlington, Mass. 01803.

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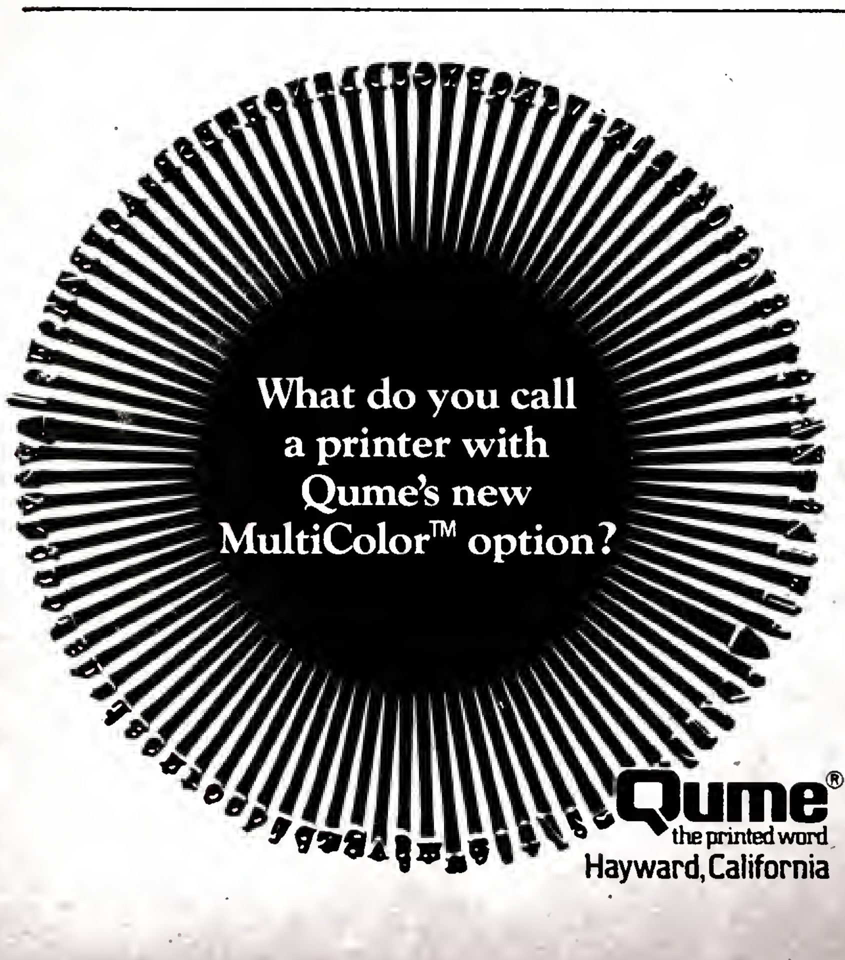

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Wangco Drive Cuts Power Use

LOS ANGELES — Wangco, Inc. has introduced the Mod 14 tape drive, a 125 in./sec unit which features extra-length vacuum columns to reduce power consumption, the firm said.

The tape path of the Mod 14 has a 180 degree wrap around the capstan which prevents tape slippage and eliminates the need for application of vacuum on the capstan as well as air-bearing guides with accompanying air compressors and filters, the firm said.

Since the tape path virtualy eliminates unsupported lengths of tape, errors resulting from tape resonances do not occur, the firm claimed.

A capacitance element is used to sense tape loop position.

Power consumption is 10.5A of standard 115 Vac power, or 6.5A at 230 Vac, the firm said.

The Mod 14 can read and record at 1,600 char./in. in dual-density PE format and 800 char./in. in NRZI. Both formats can be implemented in the same unit, Wangco said.

Up to four drives can be attached on a cable as long as 50 feet, the firm said.

The Mod 14 costs $4,500 in OEM quantities from the firm at 5404 Jandy Place, Los Angeles, Calif. 90066.

Cipher Extends Series X Drives

SAN DIEGO — Cipher Data Products, Inc. has introduced two additional members of the Series X magnetic tape drives. The models 70X and 80X handle 7- and 8.5-in. reel sizes respectively and feature speeds from 12.5- to 37.5 in./sec.

The Cipher Series X features spares commonality, the firm said.

The full line shares a common universal dual-density read/write board which features NRZI, PE or both and is pluggable for any speed from 12.5- to 75 in./sec, Cipher said.

The units are priced from $1,600 in OEM quantities. Cipher is at 5630 Kearny Mesa Road, San Diego, Calif. 92111.

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drives.

The system is designed to utilize the higher speed of the 1.3-msec 8080A which results in a 30% increase in throughput over other 8080A systems, according to the firm.

The System 8, packaged in a 5.25-in. high cabinet, includes the 8080A, minifloppy disk drive with controller and interface, 16K RAM, serial-parallel I/O and front panel for control and display, the firm said.

Software includes resident programmable read-only memory monitor, disk operating system with file management, editor, assembler and dynamic debugger. High-level languages such as PLM, Basic and Fortran are available, Gnat said.

The System 8 costs $2,895 with 30-day delivery from 7895 Convoy Court, Unit 6, San Diego, Calif. 92111.

Monolithic Provides Intel Add-On Memory

ENGLEWOOD, Colo. — Monolithic Systems Corp.'s memory for the Intel Corp. SBC 80 family of single-board computers and Intellec MDS systems is said to be hardware- and software-compatible.

The MSC 4502 can be expanded up to 16K by 8-bit in the random-access memory (RAM) section and up to 8K by 8-bit in the erasable programmable read-only memory (Eprom) section. Thus, the user can add nonvolatile memory, the firm said.

Sixteen switch selectable address start locations are available in both the RAM and Eprom.

Cycle times are faster than native memory, Monolithic said. Read cycle is 350 nsec and write cycle is 500 nsec.

The 16K by 8-bit MSC 4502 without Eprom costs $1,095 in single quantity from the firm at 14 Inverness Drive East, Englewood, Colo. 80110.

ments of the 8085, the 8080 and the SBC 80 family, the firm said.

In addition, it can be used to develop Assembly language software for the 8048, 8748 and 8035 single-chip microcomputers if an optional macro assembler is added to the resident system software.

The basic Intellec 888 package includes a 1M-byte diskette, an Intellec MDS 800 system with 64K random-access memory (RAM), a CRT, resident PL/M compiler and diskette operating system.

The system is compatible with Intellec In-Circuit Emulation modules and peripherals, such as Intel's Universal Prom (programmable read-only memory) programmer and line printer, the firm said.

Microcosm

The two- to four-times increase in on-line storage capacity allows designers to use program libraries up to seven times larger than in the past, the firm said.

Files totaling up to about 1.75M bytes can be created and used on-line, Intel added.

The basic Intellec 888 system costs $13,390, which the firm said is about $1,000 less than an older system with comparable upgrades would cost.

The optional macro assembler for the MCS-48 single-chip system costs $300 and the optional second 1M-byte diskette unit costs $3,350 from the firm at 3065 Bowers Ave., Santa Clara, Calif. 95051.

TI Has Low-Cost Modules

DALLAS — Texas Instruments, Inc. is entering the low-cost microcomputer module arena by packaging its TMS9900 family of 16-bit microprocessors and peripheral circuits into the TM990 series modules.

The TM990 line packages the microprocessor unit, I/O circuits and both erasable programmable read-only memory (Eprom) and random-access memory (RAM) into a preassembled, pretested unit on a single printed circuit board.

The first module available is the TM990/100M — a TMS9900-based CPU. This includes 1K by 16 bits of Eprom which contains a software monitor called Tibug.

The Eprom is expandable to 4K words by 16 bits, and the 256 word by 16 bit static RAM included is expandable to 512- by 16 bits.

The TM990/180M, based on the TMS9980 CPU, will be available by the third quarter of 1977.

TI said it plans to offer a line of accessories and peripherals such as the TM990/301, a microterminal which will interface over the EIA series connector.

The TM990/100M, including the on-board memory, costs $450 in single quantities. Other units' prices will be announced when the products are available from TI.

TI can be reached through P.O. Box 1443, M/S 653 (Attn. TM990), Houston, Texas 77001.

Intel Introduces Programmer For Single-Chip MSC-48 Family

SANTA CLARA, Calif. — Intel Corp.'s Microcomputer Systems Division has unveiled the Intellec Prompt 48, a programmer designed for use with the single-chip MCS-48 family.

The Prompt 48 handles the 8748, 8048 and 8035 microcomputers and can be used as a stand-alone personal programming tool and development facility or integrated with other development aids, the firm said.

The 8748 and 8035 processors are included in the system.

The Prompt 48, which extends the program memory, data memory and I/O of the single-chip microcomputers, includes an MCS-48 system with resident monitor program. The system also has 1K byte of random-access memory (RAM) for program entry and read-only memory (ROM) simulation, 256 bytes of RAM for data memory expansion and built-in erasable programmable read-only memory programmer.

I/O and TTY interfaces and system utilities, including single-step control and power supply are also included.

Program entry is made with only two keystrokes per operation code, the firm said. The hex keyboard provides 13 selectable functions.

Checkout modes include real-time, single-step and execution to preset breakpoints.

Prompt 48, available from stock, costs $1,750 and includes the 8748 and 8035 micros, system monitor in ROM, panel I/O ports and bus connector set as well as user manuals and programming aids.

Intel is at 3065 Bowers Ave., Santa Clara, Calif. 95051.

Imsai Control Computer Suitable For Use With Household Appliances

SAN LEANDRO, Calif. — Imsai Manufacturing Corp.'s 8048 control computer was designed as a user-programmable controller suitable for use with household appliances, energy conservation systems and other applications.

Based on Intel Corp.'s 8048 microcomputer chip, the 8.5-in. by 10-in. board includes features such as 1K words of read-only memory (ROM) or erasable programmable read-only memory, 64 words of internal register memory, 27 I/O lines, an internal timer/event counter and TTL compatibility.

The device also includes a cassette interface, DC power supply or battery-operated feature.

The unit comes in two versions: with the system monitor on the 8048 chip itself (ROM version) and on an Intel 8716 2K erasable read-only memory (Erom).

The 8048 control computer can enter programs into program memory, enter data into both external and internal memory, examine memory locations, execute user programs in stand-alone mode or with software breakpoints for debugging, Imsai said.

The ROM version costs $249 in kit form and $299 assembled; the Erom version costs $399 in kit form and $499 assembled. The 5V power supply costs $99 from Imsai at 14860 Wicks Blvd., San Leandro, Calif. 94577.

Contracts

OPM Leasing Services, Inc. has received a $5.5 million contract from Fireman's Fund Insurance Co., a subsidiary of American Express Co., for minicomputer equipment for its Branch Terminal System.

Lear Siegler, Inc. (LSI) has received a $4.1 million contract from the U.S. Navy for spare parts and associated equipment for tactical navigation systems which LSI produces for P-3B anti-submarine warfare aircraft.

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field engineering

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Most computer professionals are aware that today's most advanced large-system technology was developed by a company that, not too long ago, was virtually unknown.

Now the phenomenon is widely known. Amdahl's 470V/6 performs as promised. And the company performs as promised: our hardware and software support exceeds the established standards.

Not well known, however, is that this major supplier of large systems is still, in terms of staff size, relatively small. At Amdahl, you're not lost in a sea of people: we began 1976 with less than 400 people and ended it with less than 800. There's still room on the ground floor.

We're looking for above-average talent. You can expect an above-average compensation and benefits package. Please direct your response to Employment Manager, Amdahl Corporation, 1250 East Arques Avenue, Sunnyvale, CA 94086. We are, of course, an equal opportunity employer.

Immediate openings throughout the U.S. and Canada. Field candidates will undergo a training period in California on full salary with housing, transportation, and other expenses provided.

FIELD ENGINEERING SPECIALISTS

You will have a minimum of 5 years' experience in maintaining large-scale systems with in-depth training on compatible CPUs. You will have company support in assisting the Amdahl customer in his mixed-vendor environment to maintain full operations in his center. Openings in several major cities and at Amdahl headquarters in California. Please indicate 560-E on your response.

FIELD ENGINEERS

You will carry the Amdahl philosophy of customer service as well as your expertise into the field, utilizing your initiative and talents to aid the customer in restoring computer center operations regardless of the origin of the failure. Large system experience essential, preferably on compatible equipment. Please indicate 567-3E on your response and direct it to the Amdahl regional office nearest you as shown below.

FIELD ENGINEERS: TEMPORARY DUTY IN EUROPE

Immediate openings for field engineers to work at Amdahl installations in Europe as an initial assignment. You will join the permanent field engineering staff, with your first assignment being approximately one year in Europe. Same qualifications as stated elsewhere in this ad for field engineers. Please indicate 905-E on your response.

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1250 East Arques Avenue
Sunnyvale, California 94086

Amdahl Corporation
680 Fifth Avenue
New York, New York 10019

Amdahl Corporation
2021 Spring Road
Oak Brook, Illinois 60521

Amdahl Corporation
22150 Greenfield Road
Oak Park, Michigan 48237

Amdahl Corporation
5454 Wisconsin Avenue, Suite 1535
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amdahl

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Exceptional opportunities await programmer/analysts with our innovative company located in the Los Angeles area. We seek imaginative individuals with experience in systems, real-time or interactive applications. Knowledge of PDP 11 and RSTS/E or RSX a plus. We are a "no-tie" company paying excellent wages to the right people.

CW Box 5045
797 Washington St.
Newton, Mass. 02160

TECHNICAL SYSTEMS PROGRAMMER
APPLICATION PROG
COMPUTER OPERATOR

Immediate opening now available for an individual with IBM 370 or 370 OS, VS systems and Data Base experience is required. Our present system is a 370-158. Very fine fringe benefits and working environment. Please send resume and salary requirements to Personnel Department

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engineers

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New products and applications for FPS hardware requires experienced leadership in these relevant design activities:

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Experience in high speed CPU or array processors essential as is TTL Schottky design experience. Exposure to a wide variety of architectural structures and complex interface requirements are qualifying elements.

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Higher Level Language Software
Individual to lead Fortran compiler design project for FPS Array Processor. Experience in compiler design essential. Exposure to vectorization and optimization techniques desired.

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Electronic package design requires experience in areas:
High density packaging
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FPS is located in the Pacific Northwest where the "quality of living" aspects are believably outstanding. Competitive salary and benefits programs complement the career opportunities at FPS.

Send your personal resume for confidential and timely consideration to Director of Personnel, Floating Point Systems, Inc., P.O. Box 23489, Portland, OR 97223.
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FPS FLOATING POINT SYSTEMS, INC.

Production and Inventory Control Systems

Is Your Next Career Opportunity With Digital?

At Digital Equipment Corporate Headquarters in Maynard, Massachusetts, we need self-starting experienced people to lead systems development projects in production and inventory control.

MRP

Your tasks include systems design, project planning and control, systems implementation, consulting and continuing support of multiple plant locations which will use the system. You must have strong systems analysis experience with some programming and exposure to MRP-type systems. Ability to translate user needs into concrete systems specifications is a must. Project control experience is an asset.

SHOP FLOOR CONTROLS

In this position you will consult with selected plants' personnel to determine systems requirements/specifications. Evaluate existing software in and outside of the company. Identify all acquisition/development alternatives. Plan and control developments and implementation. Install in multiple plant locations; continue support to these plants. Consult with all plants for shop floor control and other P&IC systems. You must have strong systems analysis and project control experience with significant exposure to Shop Floor Controls. Theoretical control systems is a valuable asset.

Please forward your resume outlining salary history and requirements to Frank Thompson, Dept.R523, 162 Main Street, Maynard, Massachusetts 01754. We are an equal opportunity employer, m/f.

We're the company looking for people.

digital
digital equipment corporation

SENIOR PROJECT LEADER MANUFACTURING SYSTEMS

Exciting opportunity to design and implement inventory control, costing and related applications in multi-plant environment. Requires extensive manufacturing systems experience, aggressive leadership, excellent communication skills and knowledge of data base/data communications. MBA preferred. St. Louis County, Missouri location.

For appointment, write:
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Information Systems Manager

Boise Cascade
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Highly qualified individuals will find a stimulating and challenging environment at TELEMED. Recognition of ability, ideas and efforts is coupled with top rewards and outstanding potential for career advancement.

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Learn the Intel 8080

Our client, a growing manufacturer of mini and micro computer controlled instrumentation, currently is seeking an experienced mini-computer programmer. The individual should have above average ingenuity because he or she will take a very active part in the development of new hardware/software product lines. Should be able to work well as a part of a small group and also be able to work on other projects with a minimum of direction.

PDP-11 assembler language, DOS RSX RT-11 or microprocessor experience would be a plus but is not necessary.

Our staff will be avaible Monday & Thursday until 8 p.m. All inquiries strictly confidential

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Excellent opportunity for top executive with at least 10 years experience in data processing.

This position will have profit and loss responsibility and requires marketing expertise.

Candidates should have a degree preferably technical or equivalent.

Please send resume with salary requirements to:

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We are a progressive financial corporation based in Conn. Our requirements for this key management position are: minimum 3 years DPO experience and 2 years supervisory/management experience. We run IBM hardware in an on-line/realtime environment. Banking background preferred.

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PROGRAMMER/ANALYST

Oklahoma based manufacturing co. seeks strong COBOL programmer with enough RPG to do RPG maintenance and take a leading role in the redesign & rewrite of our Existing systems in ANS COBOL. The new system design is toward MRP, Production Planning and Product Costing utilizing IBM's BOMP & Product Cost subset of IPICS. We now have cardless IBM S3/12 and are looking at IBM 370 within 3-5 years. We presently process for 3 subsidiary companies, 1 remote using 3741 with a printer. Salary is open, depending on qualifications. Please reply by June 1, 1977 with resume & salary requirements to: T. Menasco, c/o Bunte Candies Inc., 129 East California St., Oklahoma City, Oklahoma 73104.

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21 SHOESTRING START-AT-HOME COMPUTER BUSINESSES

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Infodata Systems, prominent in data base management and information retrieval systems, is looking for several Senior Software Development Specialists to participate in state-of-the-art software projects intended to create signfiicant innovation in the marketplace. Large scale software systems design and implementation in an IBM, OS, VS, or MVS environment is required. Comprehensive assembler language or PL/1 experience is also required. Familiarity with any of the following is desirable: OS/VS internals, data base structures, VSAM, or artificial language design. For the right persons, compensation will be exceptional. These positions are at our suburban Washington, D.C. office.

Send resume with salary history, or call:

Mr. Thomas O'Brien
Infodata Systems, Inc.
5205 Leesburg Pike
Falls Church, VA 22041
(703) 578-3430
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EDP Sales Representative

Our company, a newly formed subsidiary of the Mennen Company, is seeking an experienced professional sales representative to present our data services to prospective clients in New Jersey. The services offered include time contracts and software applications.

The position calls for at least 2-3 years data processing sales experience, with exposure to sales management and marketing concepts being a big plus.

We offer an excellent base compensation, plus a liberal incentive plan geared to successful performance. If you have the sales know-how and are interested in a career in sales/marketing management, send your resume, including salary history, (in complete confidence), or call for appointment: Manager, Employee Placement, 538-7100, ext. 233.

MENCOM SYSTEMS, INC.
Hanover Avenue, Morristown, N.J. 07960
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programmers

At Amdahl Some Things Haven't Changed.

A lot of things have changed at Amdahl since we first began.

Six years ago, we set out to design and build a new generation of large computers. Today, that goal is a reality. At that time, the company was virtually unknown. Today, we are one of the most talked about companies in the computer industry. A year ago, we were less than 400 people. Today, we're about double that.

But some things haven't changed. Like the exciting and challenging environment. Like our excellent compensation and benefits package. Like our friendliness, regard for human feelings, and the sense of involvement that have characterized the company since we began. And we're still growing. Which is why we need help, from the same kind of competent, enthusiastic individuals who helped make us the exceptional company that we are today. Please direct your response to Employment Manager, Amdahl Corporation, 1250 East Arques Avenue, Sunnyvale, CA 94086. We are, of course, an equal opportunity employer.

SOFTWARE SYSTEMS MAINTENANCE

You will be involved with a group whose objective it is to build a better "mousetrap" . . . an error free maintenance tape. You will be responsible for the creation of all Amdahl SCP maintenance materials. Your activities will include the creation, modification and review of new SCP maintenance, the opportunity to evaluate new SCP function, and the development and maintenance of 470 model-dependent software. You must possess a detailed knowledge of at least one SCP (MVT/SVS/VS1/MVS/VM), and have a working knowledge of operating system concepts, operating system utilities, JCL, assembler language and SMP. Please indicate 3564-E on your response.

SOFTWARE QUALITY CONTROL

You will generate, apply and review all software and materials distributed to users. You will also design and develop systems programs that exercise the components of the SCPs in an effort to identify and resolve "bugs" prior to the system's shipment to the user. You possess a good working knowledge of operating systems components and have a detailed knowledge of at least one SCP (MVT/SVS/VS1/MVS/VM). You must also have a close working familiarity with operating systems utilities, SMP and assembler language. Please indicate 3563-E on your response.

SOFTWARE TECHNICAL SUPPORT

From our headquarters in Sunnyvale, you will work closely with Amdahl field personnel and customers in our Field Support Center to resolve software problems encountered by Amdahl users. This position provides a challenging opportunity to use your talents in creative problem-solving as you handle the more difficult software failures. You have a detailed knowledge of the internals of one or more operating systems (MVT, VS1, SVS, MVS, VM) as well as a working knowledge of software trouble-shooting techniques. Please indicate 357-E on your response.

PROGRAMMING SYSTEMS SUPPORT

Several immediate openings exist for experienced systems programmers in all areas of software technical support. You will be involved in both the resolution and prevention of customer software related problems. You will support and maintain OS/MVT, SVS, VS1, VS2/SVS, VS2/MVS and VM/470, and all related SCP code. You are an aggressive individual and you pride yourself on your technical ability. You have a minimum of 3 years of O/S systems programming experience. Please indicate 3561-E on your response.

amdahl

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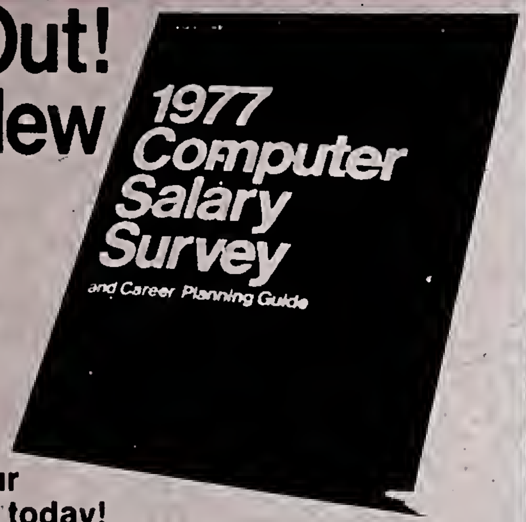

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Source Edp's *1977 Computer Salary Survey* is now available. This authoritative and up-to-the-minute report will allow you to compare your compensation directly with professionals across the country performing the same duties you perform. It also examines in detail the strategies and techniques thousands of successful computer professionals have used to enhance their careers. After fifteen years of recruiting experience, Source Edp knows how you can gain broader professional exposure, maximize your compensation and break into management. It's all in Source Edp's *1977 Computer Salary Survey* and career planning guide.

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Midwest	
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Oak Brook, Ill.	312/986-0422
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Detroit	313/352-6520
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source edp

(When writing, please be sure to indicate home address and current position title.)

If unable to call, write:
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At ADR, a dynamic leader in the software products industry, we offer all the creativity, challenge, and growth you might want—in a professional atmosphere. The following rewarding opportunities are immediately available:

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- MVS experience highly desirable.
- Familiarity with OS internals essential.
- Computer science degree or 2 years experience.

PROGRAMMER/ANALYSTS

- Strong IBM Assembler language background.
- On-line system development experience in either a DOS/VS POWER or OS/VS environment.
- At least 2 years experience or a computer science degree.

DATA BASE APPLICATIONS/PROGRAMMER

- Experienced in the use of Data Base Management systems.
- Strong IBM Assembler background.
- Minimum 3 years experience.
- College graduate or equivalent.

Please forward complete resume and salary requirements to:

SPD, Personnel Director

APPLIED DATA RESEARCH
Route 206 Center, CN-8, Princeton, N.J. 08540
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Data Processing

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Due to Expansion

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Data Processing Division
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ATTN: Mr. Joseph D. Andrews
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Harris Computer Systems, a manufacturer of medium scale digital computers, has several positions available due to rapid expansion. These positions are domestic and are situated in such key cities as:

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The following positions are now available:

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Senior management exposure in marketing and systems required plus in-depth operating systems expertise. Prefer degree plus solid marketing interface.

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Requires hardware sales track record in medium to large CPU's.

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A solid analyst background with medium and large scale operating systems. Prefer COBOL and FORTRAN background plus solid analyst/marketing supervisory experience.

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Large or medium scale CPU & peripheral sales track record.

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2-4 years in diagnostic programming and/or maintenance diagnostics.

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Heavy MIS, manufacturing, COBOL background.

FIELD ANALYST

Requires customer support and systems background. Large mainframe exposure.

SENIOR SOFTWARE INSTRUCTOR

3-5 years programming experience plus teaching background coupled with data based applications experience.

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For electronic package design. Needs temperature rise calculation background.

FIELD ENGINEER

Large mainframe experience and customer orientation.

SYSTEMS ANALYST

Requires computer science or math degree with 1-3 years' field experience. Will work in systems development or benchmark analysis.

Please forward detailed resume, including salary history, to William D. Taylor, Harris Corporation, Computer Systems Division, 1200 Gateway Drive, Fort Lauderdale, Florida 33309.

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- **IMS/VS DC/DB • IMS Performance Measurement**
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- **Hardware/Software Measurement Tools • UCC 10 Data Dictionary**
- **IMS Data-Base Design**

We offer excellent salaries fully in accord with your qualifications, comprehensive benefits, and exceptional prospects to increase your own professional standing.

For confidential consideration, forward your resume, including salary history and requirement, to:

Mr. Gary Knapp, Employment Manager

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Even Webster's Knows About QUEST

QUEST (kwest) v 1 To make a search; to go on a quest

QUEST SYSTEMS, INC. n. 1. A corporation founded in 1968 2. The largest professional recruitment firm in the U.S. functioning solely in the computer sciences. its client companies pay all employment fees, interviewing and relocation expenses. Quest is known for its deep personal commitment to relate to each candidate as an individual with individual goals. 3. Its professional staff averages over 6 years of experience in EDP recruiting (additionally, staff members have direct hands-on experience in programming, systems, hardware sales, etc) 4 Quest is presently searching for programmers and analysts (commercial, scientific, systems software) for over 3,500 client companies in the U.S *Quest has openings in over 700 U.S. towns and cities.* 5. Methodology-see Questsystem.

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Sycor, Inc., a leading manufacturer of intelligent terminals, and one of the finest growing companies in the computer industry, has immediate openings for qualified:

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Minimum two years' experience as a Systems Programmer in any of the following areas:

- Data Communications
- Compilers and Languages
- Access Methods
- Data Base Management Systems

Experience in Mini/Micro computers with Assembler language is desired. BS in Computer Science or equivalent is a must. MS is preferred.

Please send resume with salary history to:

Gopi R. Jindal, Ph.D.
Manager, Professional Employment
Sycor, Inc., 100 Phoenix Drive
Ann Arbor, Michigan 48104
(313) 995-1156

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We are a results oriented manufacturer with four plants in the Western Michigan community of Holland on Lake Michigan.

Our continuing growth and future plans have created an outstanding opportunity for a key position in developing comprehensive manufacturing applications using data collection and our expanded System/3. Your strong RPG II experience will be needed in addition to your self-starting abilities for project areas such as labor reporting, production control, product costing, budgeting, and purchasing.

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Mr. Ed Kaminskas
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High visibility position w/ readily expanding East Coast mfr. Oppty to install major mfg/fin'l systems in dynamic EDP environment. Min. 4 yrs EDP exp. w/strong prog. bkgd. + proven systems design ability. Salary to $23,000 (Fee Paid) Contact Bill Grady (in confidence).

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Dr. Bert Slafter, President
Western Wyoming College
P.O. Box 428
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Phone: 307-382-2121

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SYSTEMS PROGRAMMER

Pittsburgh National Bank requires an experienced Systems Programmer to participate in the installation/maintenance of IBM 370/158 MP Operating Systems Software.

Related responsibilities will include system generation planning and execution, system performance measurement and tuning, system modification, and installation of software packages.

Experience with MVS or VS2 and BAL required. If you have a background in Software for Technical Support, Please submit a resume including salary history to: Sharon W. Council, Personnel Division.

PITTSBURGH NATIONAL BANK
5th & Wood Street
Pittsburgh, PA 15222

All replies will be kept confidential.
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DATA BASE SUPERVISOR

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Positions are currently available in a number of the following locations: Atlanta, Boston, Chicago, Cincinnati, Cleveland, Detroit, Houston, Los Angeles, Minneapolis, New York, Philadelphia, Pittsburgh, San Francisco, St. Louis, Washington, D.C..

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M.S. or PhD in Electrical Engineering or Computer Science and five years experience in hardware and software design of real-time computer systems.

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Openings for these positions are in Dallas, Texas. **U.S. Citizenship Required.**

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- Programmer/Analysts
- Programmers
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engineers

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IMS/DC technical support candidates should have experience in IMS system generation, performance tuning, IMS dump analysis in OS/VS or MVS. VSAM experience desirable.

Systems Programmer candidates should have knowledge of SVS/MVS, HASP/JESS2, TSO, TCAM generation and maintenance. Will consider MVT, HASP, TSO/TCAM background. Opportunity for hardware/software monitor experience.

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To take an active part in the design and development of a transportable hybrid compiler which will operate in a variety of digital environments, including large and small scale systems. This senior position requires an MS in Math, Engineering or Computer Science, or equivalent experience, along with a minimum of 4 years experience in programming and systems analysis using FORTRAN and ASSEMBLY languages. Candidates must have a good knowledge and understanding of the architecture of compilers and in the creation of general purpose system software, as well as an understanding of continuous system simulation (recent experience desirable). Some travel in connection with sales support, system installation and customer training.

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- To be involved in math modeling of Power Plant Simulators. Requires a B.S. in E.E., ChE or N.E. (higher degree preferred), or degree in Computer Science with courses and/or exposure to the practical side of engineering. Must also have a strong background in applied math, and a good understanding of basic control theory; a minimum of 2 years FORTRAN IV programming; and some experience in math modeling and simulation of continuous systems, using FORTRAN, CSSL or CSMP. Senior level positions will include proposal and presentation work for large systems.
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Telephone: (404) 252-9474
Telex: 549642

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The opening offers an excellent starting salary with liberal fringe benefits. Please forward resume with salary requirements to:

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2. Faculty:

Persons who enjoy the teaching-advising role, and who have the ability to interface effectively with faculty and students in various business-related disciplines, are invited to apply.

Since all of the aforementioned positions represent tenure-track appointments, interested applicants will be expected to present the following preferable qualifications: (a) prior teaching experience; (b) knowledge of business programming, systems analysis, or data processing management; (c) an earned doctorate in a business-related discipline. (Full consideration will be given to ABD's and/or Master's degree holders with an impressive record of achievement in business or industry.)

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Qualified applicants are urged to send complete resumes together with the names of at least three references by June 15 to: Computer Systems Search Committee, c/o Office of the Vice President for Academic Affairs, Bentley College, Waltham, Massachusetts 02154.

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For immediate and confidential consideration, please send your resume with salary history to Intel Memory Systems, 1302 N. Mathilda Ave., Sunnyvale, CA 94086. An Equal Opportunity Employer M/F.

MEMORY
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- EMI Background

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Employment Department
Terminal Systems Division-Dayton
NCR Corporation
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Assistant Professor

Computer Science

Background in Compuer Science and possession of the earned doctorate is required. Appointment is normally three years commencing September, 1977. Primary responsibility will be teaching undergradudate Computer Science courses. Salary commensurate with experience. Address inquiries to Chairman, Applied Science Department, U.S. Naval Academy, Annapolis, Maryland 21402. Phone: (301) 267-2797.

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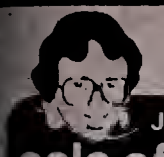

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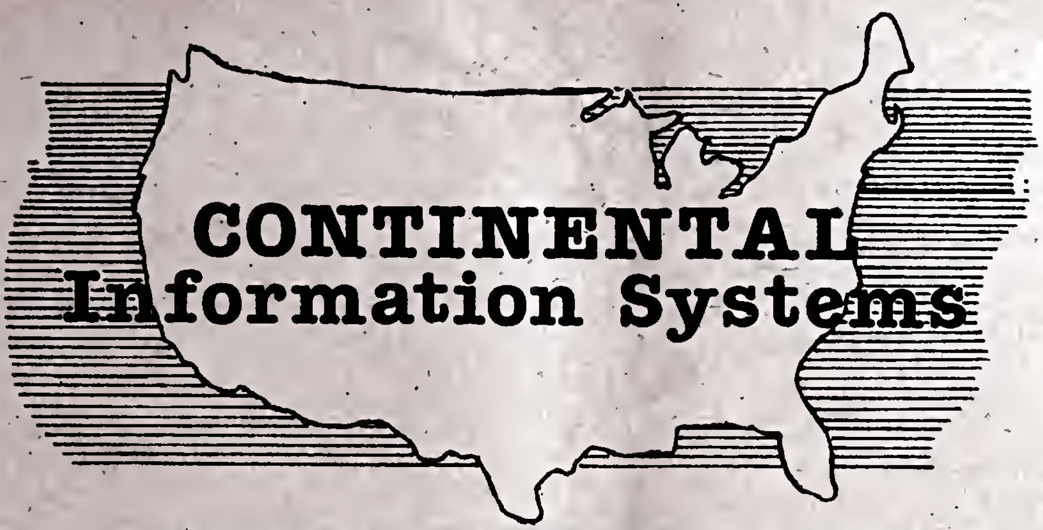

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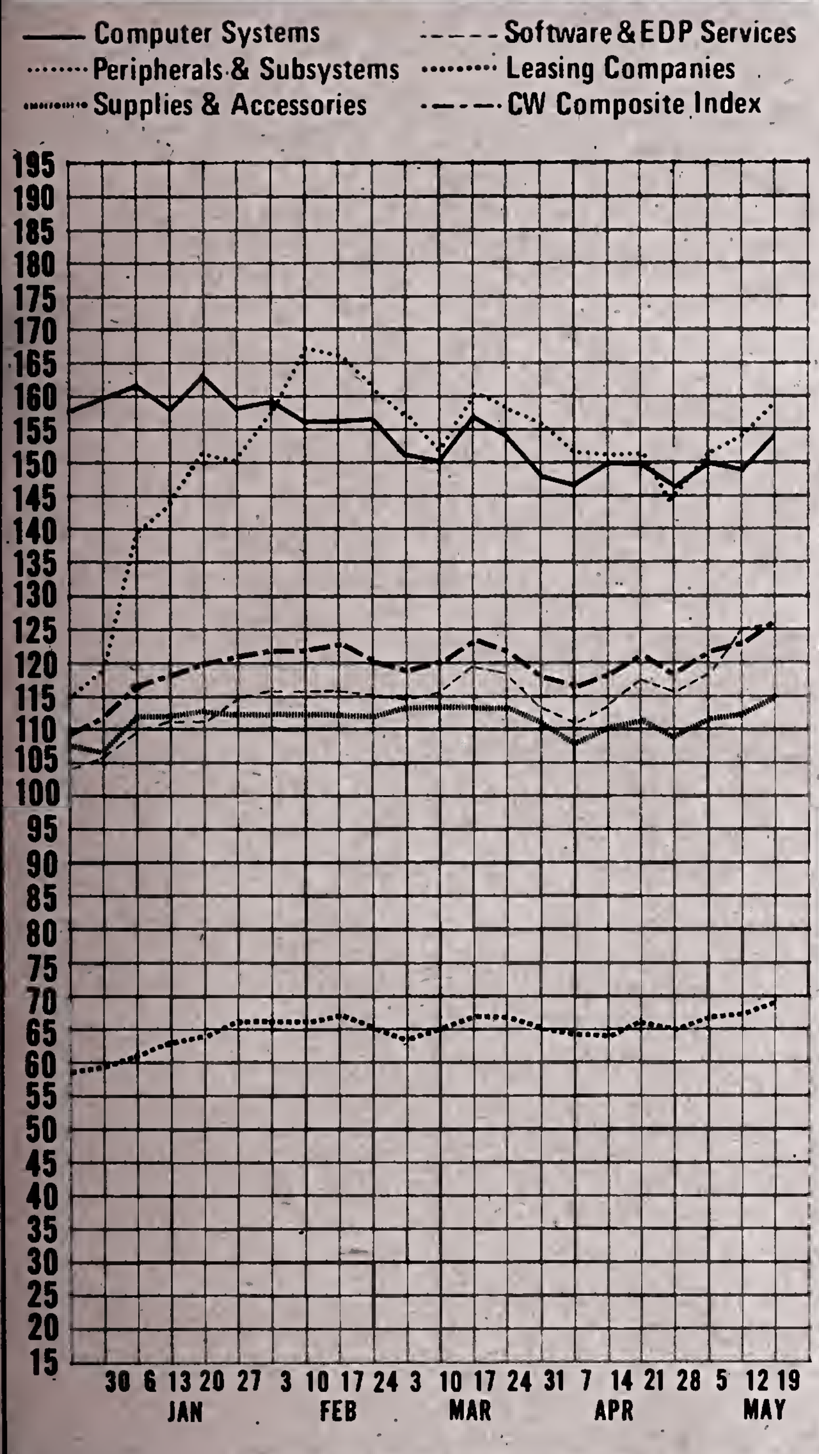

Earnings Reports

MEMOREX

Three Months Ended March 31

	1977	1978
Shr Ernd	$2.34	$1.59
Revenue	100,101,000	79,419,000
Tax Cred	5,470,000	3,794,000
Earnings	13,675,000	9,083,000

MICRODATA

Three Months Ended Feb. 26

	1977	1976
Shr Ernd	.....	$.34
Revenue	$8,626,000	6,255,000
Earnings	8,000	587,000
6 Mo Shr	.31	.59
Revenue	18,203,000	11,157,000
Earnings	695,000	1,001,000

MOSTEK

Thirteen Weeks Ended April 1

	1977	1976
Shr Ernd	$.20	$.14
Revenue	17,199,000	12,574,000
Earnings	826,000	580,000

NCR

Three Months Ended March 31

	1977	1976
Shr Ernd	$.61	$.54
Revenue	515,267,000	471,111,000
Earnings	16,609,000	13,224,000

CENTRONICS DATA COMPUTER

Three Months Ended March 31

	1977	1976
Shr Ernd	$.87	$.61
Revenue	14,809,298	13,503,053
Earnings	3,249,589	2,954,991
9 Mo Shr	1.69	1.61
Revenue	42,029,634	37,906,998
Earnings	9,171,529	7,753,561

COMPUSCAN

Three Months Ended Feb. 26

	1977	1976
Shr Ernd	$.17	$.17
Revenue	3,662,000	3,474,000
Earnings	383,000	301,000
9 Mo Shr	.42	.58
Revenue	10,580,000	9,419,000
Tax Cred	.....	251,000
Earnings	937,000	971,000

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TRADE*QUOTES

Computerworld Stock Trading Summary

CLOSING PRICES hEOhESOAY, HAY 18, 19TT

All statistics compiled, computed and formatted by TRADE★QUOTES, INC. Cambridge, Mass. 02139

COMPUTER SYSTEMS

EXCH		1977 RANGE (1)	CLOSE MAY 18 1977	WEEK NET CHNGE	WEEK PCT CHNGE
C	APCAHL CCRP	0- 39	24 1/4	-1	-3.9
N	BLRRCUGHS CORP	55- 91	60	+2 5/8	+4.5
C	CCPPUTER AUTCMATICN	18- 25	24 1/2	+1 3/4	+T.6
N	CCNTROL CATA CORF	20- 26	21 3/4	+ 3/8	+1.7
N	CATA GENERAL CORP	35- 46	41 1/4	+4 7/8	+13.4
C	CATAPCINT CCRP	18- 30	22 5/8	+ 5/8	+2.8
N	OIGITAL ECUIPMENT	37- 53	43 7/8	+3 7/8	+9.6
N	ELECTRONIC ASSOC.	2- 3	2	+ 1/8	+6.6
A	ELECTRCNIC ENGINEER.	8- 10	6 1/4	C	0.0
C	FCUR-PHASE SYSTEMS	14- 17	15	- 1/8	-0.8
N	FCXBCRC	42- 54	51 1/4	-2 1/4	-4.2
C	GENERAL ALTCMATICN	6- 9	6 1/2	+ 3/8	+6.1
C	GRI CCMPUTER CORP	1- 1	5/8	0	0.0
N	HEWLETT-PACKARC CC	69- 87	T7 1/8	+4 1/2	+6.1
N	HCNEYWELL INC	44- 53	52	+1 1/4	+2.4
N	IBM	252-286	254	+1 1/4	+0.4
O	MANAGEMENT ASSIST	6- 9	5 1/2	- 1/4	-4.3
O	MEMCREX	23- 29	25 1/4	+ 7/8	+3.5
O	MICRCOATA CCRP	7- 18	9 1/4	+1 1/2	+19.3
C	MCOULAR CCMFUTER SYS	5- 8	7 3/4	+ 5/8	+8.7
N	NCR	32- 38	35 3/8	+1 1/8	+3.2
O	PRIME CCMPUTER INC	12- 17	14 3/8	+ 1/4	+1.T
N	PERKIN-ELMER	17- 21	18	+1 1/4	+T.4
N	RAYTHECN CO	55- 64	63 7/8	+ 7/8	+1.3
N	SPERRY RAND	34- 42	37	+1 I/8	+3.I
C	SYCCR INC	8- 15	9 1/4	0	0.0
A	SYSTEMS ENG. LABS	5- 7	6 1/4	0	0.0
N	VARIAN ASSOCIATES	15- 20	19 3/4	- 1/8	-0.6
A	WANG LABS.	14- 18	16 1/4	+ 1/4	+1.5

LEASING COMPANIES

EXCH		1977 RANGE (1)	CLOSE MAY 18 1977	WEEK NET CHNGE	WEEK PCT CHNGE
C	BCCTHE CCLRIER CCRP	8- 10	8 7/8	+ 1/4	+2.8
C	CCMDISCC INC	10- 13	10 1/2	0	0.0
A	CCMMERCE GRCUP CORP	2- 2	2	- 1/8	-5.8
A	CCMFUTER INVSTRS GRP	1- 2	T/8	-	-6.2
M	DATRONIC RENTAL	1- 2	1	0	0.0
A	CCL INC	1- 2	1 3/4	+ 1/4	+16.6
N	OFF INC	6- 8	6 1/2	+ 1/8	+1.9
N	ITEL	13- 16	15 1/2	+1	+6.8
N	LEASCC CORP	19- 24	22 3/8	+ 3/8	+1.7
C	LEASPAC CCRP	1- 1	3/4	0	0.0
C	NRG INC.	0- 0	1/8	0	0.0
A	PICNEER TEX CCRP	8- 11	8 T/8	+ 5/8	+T.5
N	L.S. LEASING	10- 13	12 3/4	+1 5/8	+14.6

EXCH: N=NEW YORK; A=AMERICAN; P=PHIL-EALT-WASH
L=NATICNAL; M=MIOWEST; O=OVER-THE-COUNTER
C-T-C PRICES ARE BIC PRICES AS CF 3 P.M. OR LAST BID
(1) TC NEAREST OCLLAR

SOFTWARE & EOP SERVICES

EXCH		197T RANGE (1)	CLOSE MAY 18 197T	WEEK NET CHNGE	WEEK PCT CHNGE
O	AOVANCEO COMP TECH	1- 2	1 1/4	+ 1/8	+11.1
O	ANACCMP INC	7- 9	8 7/8	- 3/8	-4.0
A	AFPLIED OATA RES.	5- 7	7	+ 7/8	+14.2
N	ALTOMATIC OATA PROC	23- 30	26	+ 1/4	+0.9
O	CCLEMAN AMERICAN COS	2- 2	1 3/4	- 1/8	-6.6
O	CCMPU-SERV NETWORK	10- 15	12 3/4	- 1/4	-1.9
O	CCMP ELECTION SYSTMS	6- 9	8 1/4	0	0.0
C	CCMPUTER HCRIZONS	1- 1	1 1/4	0	0.0
C	CCMPLTER NETWORK	6- 7	6 5/8	0	0.0
N	CCMPUTER SCIENCES	7- 9	6 7/8	- 1/4	-3.5
C	CCMPUTER TASK GROUP	1- 2	2	0	0.0
C	CCMPUTER LSAGE	2- 3	2	- 1/8	-5.8
O	CCMSHARE	5- 7	5 1/2	+ 1/4	+4.7
O	CATA CIMENSIONS INC	4- 5	4 3/8	+ 5/8	+16.6
O	OATATAB	1- 2	2 1/8	+ 1/8	+6.2
N	ELECTRONIC CATA SYS.	16- 19	1T 1/2	+ 1/2	+2.9
C	INSYTE CORP	2- 3	1 3/4	- 1/8	-6.6
O	IPS COMPUTER MARKET.	1- 2	1 1/2	0	0.0
O	KEANE ASSCCIATES	3- 4	3 1/4	0	0.0
O	KEYOATA CCRP	2- 3	2 1/4	0	0.0
A	LCGICCN	7- 16	14	0	0.0
A	MANAGEMENT OATA	1- 2	1 1/4	0	0.0
A	NATIONAL CSS INC	19- 25	20 1/4	+ 3/4	+3.8
C	NATICNAL CATA CORP	5- 7	4 7/8	0	0.0
A	ON LINE SYSTEMS INC	17- 22	17 1/2	- 7/8	-4.7
N	PLANNING RESEARCH	3- 5	3 5/8	+ 1/8	+3.5
C	PRCGRAMMING & SYS	1- 1	5/8	- 1/8	-16.6
O	RAPIOATA INC	2- 3	2 1/8	+ 1/8	+6.2
C	REYNCLOS & REYNOLC	1T- 20	1T 1/2	+ 1/4	+1.4
O	SCIENTIFIC CCMPUTERS	1- 3	2 3/4	0	0.0
O	TYMSHARE INC	14- 20	16	-1 1/4	-T.2
A	URS SYSTEMS	4- 5	4 5/8	+ I/8	+2.7
N	WYLY CCRP	1- 2	1 1/2	0	0.0

PERIPHERALS & SUBSYSTEMS

EXCH		1977 RANGE (1)	CLOSE MAY 18 1977	WEEK NET CHNGE	WEEK PCT CHNGE
N	ACORESSOGRAPH-MULT	10- 14	11 1/2	+ 5/8	+5.T
C	AOVANCEC MEMORY SYS	T- 9	8 1/4	+ 1/4	+3.1
N	AMPEX CCRP	8- 9	8 3/4	+ 3/8	+4.4
O	ANOERSON JACOBSON	3- 4	3 1/2	0	0.0
N	APPLIEC CIG CATA SYS	10- 16	10 T/8	- 1/8	-1.1
O	BEEHIVE INT'L	10- 12	9 5/8	- 1/4	-2.5
A	BCLT,BERANEK & NEW	7- 8	6 3/4	0	0.0
N	BUNKER-RAMO	8- 12	9 1/4	- 3/8	-3.8
A	GALCCMP	3- 5	3	+ 1/4	+9.0
O	CAMBRIDGE MEMORIES	1- 2	2 1/4	+ 7/8	+T1.3
N	CENTRONICS OATA CCMP	22- 28	25 3/4	+1 3/8	+5.6
C	CCDEX CORP	31- 47	46 1/2	0	0.0
C	CCGNITRONICS	1- 1	T/8	0	0.0
C	CCMFUTER COMMUN.	5- 6	5 3/4	+ 1/4	+4.5
O	COMPUTER CONSOLES	4- 6	6 1/4	+ 3/4	+13.6
A	CCMFLTER ECUIPMENT	2- 3	3	0	0.0
O	CCMPUTER TRANSCEIVER	1- 1	1 1/8	- 1/8	-10.0
C	CCMTEN	10- 13	11	0	0.0
N	CCNRAC CORP	24- 27	26 3/4	+1	+3.8
O	CATA ACCESS SYSTEMS	4- 5	4 3/4	0	0.0
C	CATA 100	7- 8	6 7/8	- 1/8	-1.7
A	OATA FRCOLCTS CCRF	9- 13	10 3/8	0	0.0
C	OATA TECHNOLOGY	3- 4	3 3/4	0	0.0
C	DATUM INC	1- 2	1 1/2	C	0.0
O	OECISICN CATA CCMPUT	2- 2	1 3/4	0	0.0
C	CELTA CATA SYSTEMS	1- 1	3/8	0	0.0
N	ELECTRCNIC M & M	4- 5	4	- I/8	-3.0
O	FABRI-TEK	1- 2	7/8	-	-6.7
C	GENERAL CCMPUTER SYS	0- 2	1 3/8	- 1/8	-8.3
N	HAZELTINE CORP	9- 12	10	- 1/8	-1.2
N	HARRIS CCRP	28- 39	39	+1 I/4	+3.3
A	INCCTERM CORP	12- 15	12 1/2	+ 1/2	+4.1
C	INFCREX INC	4- 7	4 1/4	0	0.0
C	INFCRMATICN INTL INC	11- 14	10 7/8	+ 1/8	+1.1
O	INTEL CCRF	38- 57	45 1/2	+ 1/2	+1.1
A	LUNCY ELECTRONICS	3- 6	4	- 1/8	-3.0
C	MSI OATA CCRP	6- 8	7 3/4	C	0.0
N	MCHAWK CATA SCI	5- 8	5 1/8	+ 5/8	+13.8
O	PENRIL CCRF	2- 5	4 5/8	+ 1/8	+2.7
A	PERTEC CORP	7- 9	7	+ 1/2	+7.6
A	PCTTER INSTRUMENT	2- 2	1 3/4	0	0.0
C	FRECISION INST.	2- 2	1 1/2	C	0.0
O	CLANTCR CCRP	4- 5	4 3/8	0	0.0
C	RECCGNITION EQUIP	7- 10	7 1/8	- 1/8	-1.7
C	SCAN CATA	1- 2	1 3/8	- 1/8	-8.3
O	STORAGE TECHNOLCGY	10- 12	11 1/8	+ 7/8	+8.5
C	T BAR INC	7- 10	9 3/8	C	0.0
C	TALLY CCRP.	4- 6	4 5/8	0	0.0
C	TEC INC	7- 10	9 3/8	+ 5/8	+7.1
N	TEKTRCNIX INC	29- 68	33 3/8	+4 3/8	+15.0
N	TELEX	2- 3	2 1/2	+ 1/8	+5.2
C	WILTEK INC	1- 1	1/4	0	0.0

SUPPLIES & ACCESSORIES

EXCH		1977 RANGE (1)	CLOSE MAY 18 1977	WEEK NET CHNGE	WEEK PCT CHNGE
O	BALTIMORE BUS FCRMS	2- 4	2 1/8	- 1/8	-5.5
A	BARRY WRIGHT	10- 14	12 7/8	- 3/8	-2.8
O	CYBERMATICS INC	1- 1	1/2	0	0.0
C	CLFLEX FRCCUCTS INC	14- 18	15 7/8	0	0.0
N	ENNIS BUS. FCRMS	6- 7	5 3/4	0	0.0
C	GRAHAM MAGNETICS	11- 14	13 1/2	+1 1/2	+12.5
C	GRAPHIC CCNTRCLS	15- 17	16 1/4	+ 1/4	+1.5
N	3M CCMPANY	48- 56	52 1/4	+2	+3.9
C	MCCRE CCRP LTC	30- 37	31 1/4	+ 1/2	+1.6
N	NASHLA CCRP	16- 22	21 1/2	+3 1/4	+17.8
C	STANCARO REGISTER	18- 24	23 1/4	+1 3/4	+8.1
C	TAB PRCCUCTS CO	13- 17	15 3/4	- 1/8	-0.7
N	UARCC	19- 22	20 1/2	+ 1/8	+0.6
A	WABASH MAGNETICS	10- 15	14	- 3/8	-2.6
N	WALLACE BLS FCRMS	17- 21	17 5/8	- 1/8	-0.7

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